JPRS 75040

31 January 1980

USSR Report

RESOURCES

No. 915

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50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. JPRS 75040	2.	3. Recipient's Accession No.
4. Title and Subtitle USSR REPORT: RESOURCES, No. 915			5. Report Date 31 January 1980 6.
7. Author(s)			8. Performing Organization Rept. No
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No 11. Contract(C) or Grant(G) No (C) (G)
12. Sponsoring Organization Name and Address As above			13. Type of Report & Period Covered 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

This serial report contains information on energy, fuels and related equipment; fishing industry and marine resources; water resources, timber, and electric power and power equipment.

17. Document Analysis a. Descriptors

USSR
Natural Resources
Electric Power
Energy
Energy Conservation
Fisheries
Fuels
Timber
Forestry
Water Supply
Economics

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group 2C, 2F, 5C, 10, 21D

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
Unlimited Availability Sold by NTIS Springfield, Virginia 22161	UNCLASSIFIED	70
	20. Security Class (This Page) UNCLASSIFIED	22. Price

(See ANSI-Z39.18)

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

JPRS 75040

31 January 1980

USSR REPORT

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ELECTRIC POWER AND POWER EQUIPMENT

PROGRESS, PROBLEMS OF RURAL ELECTRIFICATION REVIEWED

Moscow TEKHNIKA V SEL'SKOM KHOZYAYSTVE in Russian No 6, Jun 79 pp 34-36

[Article by Engr N. I. Myasnikov: "Tasks of Electrification Workers"]

[Excerpts] Our nation has developed a strong power base for satisfying the needs of agriculture for electric power. Virtually all rural population points have been converted to centralized power supply. In 1979, consumption of electric power in rural localities exceeded 100 billion kilowatt hours. For this an enormous amount of work had to be done to build power transmission lines and transformer substations. The total length of the distribution networks with a voltage of 0.4-20 kilovolts operated on the balance sheets of the power systems of the kolkhozes and sovkhozes was 3.5 million km. This surpasses by 5-fold the total length of all the higher voltage lines.

The length of agricultural power transmission lines of 35-110 kilovolts equals almost 300,000 km. The number of agricultural transformer substations has reached 15,000 with a total power of 60 million kilovolt-amps, while there are 700,000 consumer substations with a voltage of 6-20/0.4 kilovolts with 80 million kilovolt-amps.

The kolkhozes and sovkhozes operate over 11 million electric motors and 2 million various electrical units with a total capacity of over 74 million kilowatts.

Due to this one-third of the cattle farms in the nation have been fully mechanized, 60 percent of the poultry and pig-raising farms, and the level of electrical mechanization for water supply and cow milking has risen. Electrical energy is widely used for the cleaning and drying of grain, and for processing products in the hothouse combines.

Extensive mechanization of agricultural production has also caused high growth rates for the consumption of electric power which annually are 12-15 percent. In accord with the decisions of the 25th CPSU Congress during the Tenth Five-Year Plan this is to rise by 75 percent, and in 1980 will reach 130 billion kilowatt hours. The electricity-to-labor ratio on

the kolkhozes and sovkhozes calculated per worker engaged in agricultural production has risen from 381 kilowatt hours in 1965 up to 2,119 kilowatt hours in 1977, or by 6-fold, while the use of electric power for utility and householf needs has risen by 3.5-fold. This has made it possible to increase substantially labor productivity in agriculture and to raise the level of production and everyday life.

At the same time, in the electrification of agriculture there are a number of difficulties and unsolved problems which impede the rate of introducing it into production. Electric power is still insufficiently used in a number of production processes. Thus, by the start of 1979, in the nation more than one-half of the cattle farms still had not been fully converted to electrical equipment. There were still many farms on which not a single electric motor had been installed. As a whole for the nation, the electricity-to-labor ratio for a worker in agricultural production is still several-fold less than for an industrial worker.

A majority of the distribution networks has been planned and built from the idea of supplying electric power to multisector farms with small production and utility-household consumers scattered over a vast territory. As a rule the networks are radial with three (110/35/10/0.4 kilovolt) and more rarely two (110/10/0.4 kilovolt) voltage transformer stages. At present the ratio of the length of the 35-110 kilovolt feeder lines and the 6-10 kilovolt distribution lines differs significantly from the optimum. The rural networks are characterized by great length and branching, and are poorly supplied with automatic voltage regulators, that is, there are objective reasons which do not make it possible to effectively supply the consumers from the rural networks. For this reason for satisfying the ever increasing demands which are made by the industrial method of producing agricultural products upon the quality of power supply, it is essential to reconstruct the existing lines and transformer substations and build new ones. Unfortunately, the contracting organizations of the USSR Ministry of Power and Electrification year after year have not fulfilled the plans for this work. Over the last 3 years alone, on the nation's sovkhozes and kolkhozes the plan for completing power transmission lines has been underfulfilled by more than 30,000 km. A particularly large lag has been allowed in Kirovskaya, Kemerovskaya, Irkutskaya, Kipetskaya and certain other oblasts of the RSFSR. Glavsel'elektroset'stroy [Main Administration for the Construction of Rural Electric Power Plants and Electric Power Networks] of the USSR Minenergo [Ministry of Power and Electrification] has delayed in completing transformer substations in Altayskiy, Primorskiy and Khabarovskiy krays as well as in Amurskaya, Kuybyshevskaya, Novgorodskaya, Ryazanskaya and several other oblasts.

In the RSFSR over the 3 years of the current five-year plan, 28,000 km of the planned power transmission lines have been built, including around 6,000 km in the nonchernozem zone of the RSFSR. During this time 8,623,000 kilovolt-amps of transformer capacity were put into operation with a plan of 12,429,000 kilovolt-amps. The plan for building substations in the

nonchernozem zone was fulfilled only by 72 percent during these years. Here the reliability of power supply for the kolkhozes and sovkhozes remains low, since the length of the 6-20 kilovolt networks significantly exceeds the standards, while only 30 percent of the main trunks have been ringed.

In February of the current year the CPSU Central Committee and the USSR Council of Ministers approved the Decree "On Measures to Further Develop Agricultural Electrification." This document is a manifestation of the new concern of the party and the government for the further development of electrification for agricultural production and for improving the cultural and domestic conditions of the rural population.

It obliges the USSR Ministry of Agriculture, the USSR Minenergo, the USSR Ministry of Land Reclamation and Water Resources, the USSR State Committee for Production and Technical Supply of Agriculture [Goskomsel'khoztekhnika] and the Union republic councils of ministers to bring the volume of electric power consumption in agriculture up to 170-190 billion kilowatt hours in 1985, to increase in 1981-1985 the power-to-labor ratio in agricultural production by 1.6-1.8-fold and the consumption of electric power for utility and domestic needs per rural inhabitant by 1.8-2-fold, as well as carry out its further introduction into agricultural production for full mechanization and automation of the processes in crop and livestock raising.

If it is considered that in 1970 the nation's agriculture consumed around 40 billion kilowatt hours, and over the next 5 years the increase in electric consumption is planned at 50 billion kilowatt hours, then it is clear what a magnificent task has been posed by the party and government for the power workers.

In order to accelerate the growth of the power-to-labor ratio and to increase the level of agricultural electrification and the dependability of power supply, the CPSU Central Committee and the USSR Council of Ministers have ordered the USSR Minenergo, the USSR Ministry of Agriculture, the USSR Ministry of Land Reclamation and Water Resources and the Union republic councils of ministers over the next few years to build around 1 million kilometers of high voltage and low voltage lines for agriculture, to reconstruct 180,000 km of overhead power transmission lines with a voltage of 0.4-20 kilovolts, to put into operation transformer substations for 40 million kilovolt-amps, and to organize 1,308 repair and operating points at the enterprises and in the power network regions of the USSR Minenergo.

The Ministry of Electrical Equipment Industry [Minenergotekhprom], the USSR Minenergo, the USSR Ministry of Industrial Construction, the USSR Ministry of Construction and certain other ministries have been given the quota of building and reconstructing 32 electrical equipment plants.

The USSR Ministry of Agriculture, the All-Union Academy of Agricultural Sciences imeni V. I. Lenin, together with the USSR Minenergo and the

Minelektrotekhprom, have been instructed to work out and develop series production of new types of electrical engineering equipment and comprehensive devices needed for the power supply of agriculture and the extensive use of electric power in kolkhoz and sovkhoz production.

For carrying out these tasks it is essential to raise the construction pace of the power networks, and to increase the production and delivery to agriculture of power transformers, distributor devices, high- and low-voltage equipment, noninsulated wire, cable products and other materials and electrical equipment. This will make it possible to achieve reliable power supply for the kolkhozes, sovkhozes and other state agricultural enterprises.

In the next few years, there will be a sharp rise in the deliveries of electric motors which possess increased safety and reliability as well as other equipment.

There are plans to manufacture the necessary quantity of gasoline operated power generators to supply electric power to production installations and to improve the cultural, domestic and hygienic conditions of persons in remote pastures.

The centralized major overhaul of agricultural electric motors of the 4A series has been entrusted to the enterprises of Minelektrotekhprom, and for imported and all other types to the Goskomsel'khoztekhnika.

The policy of further electrification of the countryside conforms to the urgent needs of the everyday life of the farmers. In the countryside there are more and more television sets, refrigerators, washing machines and other electrical appliances, and it is essential that they operate reliably in making housework easier and in saving the time and energy of people.

It is essential to consistently improve the quality of electric power supply for the kolkhozes and sovkhozes. Interruptions in its supply lead to a serious disruption of production methods, to the failure of equipment and to irrecoverable product losses. These also tell on the living conditions of people. The enterprises of the USSR Minenergo should ensure stability of power supply everywhere. Out of the 6,000 major agricultural projects put by government decision among consumers of the first category, as yet only one-half has a reserve power supply. The kolkhozes and sovkhozes continue to maintain on their balance sheets thousands of kilometers of power transmission lines the repair and operation of which are poorly carried out in a number of regions. It is essential to immediately systematize the organization of labor, to improve work and strengthen the technical equipping of the operational subdivisions.

The efficient use of electrical power, equipment and machines depends significantly upon the activities of the engineer services of the farms and

the associations of Goskomsel'khoztekhnika. At the same time, the supply of the countryside with the required personnel is clearly insufficient. The farms are experiencing an acute lack of electrical engineers and qualified electricians. There are few groups of specialists of this category in the rayon and oblast centers. The solution to the problem requires attention by a number of departments and above all the USSR Ministry of Agriculture, Minenergo, Goskomsel'khoztekhnika, and the bodies of the higher school and vocational-technical education. It is essential to work out jointly effective measures to improve the training system and raise the skills of the specialists, and to improve the working and living conditions for the workers of this category. This will make it possible to reduce personnel turnover.

In Belorussia, the Tatar ASSR, Krasnodarskiy Kray, Bryanskaya, Vologodskaya, Kurganskaya, Moscow, Penzenskaya, Permskaya and a number of other oblasts, interfarm Sel'khozenergo [Agricultural Power] production and operating associations have been organized, and these have created engineer services and are successfully solving the questions of electrifying agricultural production and the operation of equipment. In 1978 alone, these associations provided 145 million rubles worth of services to the kolkhozes and sovkhozes of the RSFSR. The number of personnel working in them exceeds 36,000 persons. They have prepared for operation 3,615 units used for preparing vitamin-grass meal, 4,560 feed shops, 11,000 grain cleaning and drying points, they have automated 900 pumping units and 400 boiler units, and have also trained a significant number of specialists. As a result of introducing planned preventive repairs and maintenance, the failure rate of electric motors has been reduced by 4-5-fold, the reliability of the electrical units and the efficient use of electric power have been significantly increased, and the stoppages of production equipment have been reduced. However these associations as yet have a poor physical plant.

The decree of the CPSU Central Committee and the USSR Council of Ministers provides for the allocating of equipment and materials, metering instruments and tools.

The primary task of the local party, soviet and economic bodies, the kolkhozes and sovkhozes, the power and construction workers and the installers consists in carrying out the outlined program for the further development of agricultural electrification. It is a question primarily of assuming strict control over the carrying out of the plans for completing the new lines and transformer substations, raising the responsibility of the personnel for reliable supply of power to the kolkhozes and sovkhozes, and more widely developing the socialist competition of the rural power workers.

A rise in the energy capacity of the countryside is a crucial area in the struggle for carrying out the plans of the 25th CPSU Congress. The successful carrying out of the quotas in this area will accelerate the development of the productive forces of agriculture, and will help to eliminate the

socioeconomic, cultural and domestic differences between the city and the countryside, and to constantly improve the standard of living of its workers.

10272
CSO: 1822

CONSTRUCTION PROBLEMS AT SMOLENSK NUCLEAR PLANT DESCRIBED

Moscow STROITEL'NAYA GAZETA in Russian 5 Dec 79 p 2

[Article by V. Kapel'kin, special correspondent of STROITEL'NAYA GAZETA: "Without Current"]

[Text] The starting up of the first power block of the Smolensk AES which was conceived of as the standard in high-speed assembly line construction for the entire series of AES with reactors of the RBMK-1000 type, has been shifted to the future, the tenth (!) year of construction. The national economy has not received the expected addition of power. Soviet and imported equipment lies idle, with 150 million rubles accumulating at the construction site. In a word, an unpleasant phenomenon which an overdue date always is.

At the same time, in 1971, when the first stake was driven in a ceremony in a picturesque corner of the Smolensk area, not far from the Desna River, no one doubted the success of building the plant. The confidence in a rapid victory was reinforced by the fundamentally new solutions of the designers which promised a great savings in time and labor for the construction workers. There was even the plan to put the project in operation ahead of time, in 1976.

The chief innovation was the industrial preassembled and site-cast method of erecting the buildings as proposed and patented by the general designer Gidroproyekt [All-Union Design and Scientific Research Institute imeni S. Ya. Zhuk] in place of the labor-intensive "wet" concreting processes and the subsequent plastering of the interior walls. The idea was to have a plant producing reinforced concrete products to manufacture reinforced units in the form of reinforced ribbed form panels, and then with the delivery of these products called "trunks" to the site, to weld them together and then using a pumpcrete machine to fill in the internal space. Other elements of the plant were also worked out in a preassembled model. What appeared was an assembly-line method for building the Smolensk AES.

But the assembly line soon broke down. The enormous order specifications for prefabricated reinforced concrete terrorized the workers of

Glavenergostroy [?Main Administration for the Power Construction Industry] in charge at the USSR Minenergo [Ministry of Power and Electrification] with manufacturing the structural elements. Because not only the "trunks" but also the weight of the other ordered products did not meet the departmental standards and did not fit in the product range of articles produced by the main administration. As an example, such a comparatively simple element of the plant as stairwell and elevator unit included 800 types of parts. The administration and directorate of the AES had to count on their own forces. From available materials they began to set up and equip a yard for producing reinforced concrete products, bringing it ultimately up to the level of a shop. It took a whole year for this as Gidroproyekt refused to sanction the incorporation of this project in the estimate of the construction site. The plans to put the station in operation ahead of time began to fade.

Finally, the reinforced elements, the flooring slabs and other homemade elements arrived at the construction site. And under pressure from the ministry, Glavenergostroy also began to deliver some of the vast range of products. But this still did not mean that the construction pace moved ahead steadily and rhythmically. It turned out that the pace in the various links of the production chain was not balanced. The installation of the "trunks" moved far ahead, but the pouring of concrete fell behind, although in terms of the production conditions these operations had to be done simultaneously. The capacity of the concrete plant was insufficient, and it required not two pumpcrete machines but rather four to deliver the mix to the site, and so forth.

The site-cast joints between the "trunks" became a sore point for the concrete workers. Gidroproyekt did not provide any recommendations on how to apply the form to the 40-cm crack between the reinforced elements. Panels from bakelite plywood had to be fastened with cribs and scaffolds (they were indispensable in spite of the assertions of Gidroproyekt) on handmade steel studs the ends of which had to be cut off after the forms were removed. The uneven areas left by the welding arc and occurring on the joints of the elements brought plasterers to the scaffolding and these workers should have been retired. Even now at the plant the area of plastered and smoothed surfaces has reached 15,000 m^2. An actually the unit of the "trunk" with the filler was more expensive than the corresponding amount of site-cast reinforced concrete using the old method. The contractors--Spetsatomenergomontazh [?Special Atomic Power Installation Trust] and Donbassatomenergomontazh [?Donets Basin Atomic Power Installation Trust]--suffered losses.

"Organize construction better, introduce mechanization and you will rake in the profits," asserted the designers. "But who gave you the right to portray the desired degree of mechanization as the actual one and by using reduction factors to reduce the time for carrying out the operations as well as the wage rates?" argue the representatives of the general contractor.

Both sides have grounds for their arguments. In actuality, the construction workers miscalculated on the capacity of the concrete plant, and they did not introduce cast concrete mixes for filling the reinforced elements (these mixes do not require vibrating work), while the installation workers did not use modern equipment and semiautomatic welding, and so forth. Here the chief designer of Gidroproyekt, P. Skhodkin, in criticizing the construction workers, is most correct. But what about the designs? Certainly without standardizing the elements and having them conform to the departmental standards or approving them as departmental standards, there can be no question of an assembly line and high-speed construction. Undoubtedly the joining of the reinforced elements must be improved. And instead of futile arguing, without losing any time, the participants of creating the head model of the AES must set to work realizing the potential advantages of the new idea.

It is important to standardize not only the elements for building the AES with reactors of the RBMK-1000 type, but also the stations themselves, or at least their basic elements and assemblies. Of course, there will scarcely be twin plants as there are with large-panel buildings of the same series. For example, there will be greater demands on the safety of the AES, and the satisfying of these cannot be deferred until another series comes along. For this reason one can only doff one's hat to the workers of Gidroproyekt and, in particular, the chief designer P. Skhodkin who have come up with a new idea in achieving the sterility of the AES for the environment.

However in working out the prototype plant the designers endeavored to have their way too much. For example, the further construction goes on at Smolensk, the greater the miscomprehension between the client and the contractor over the question of turning the reactors 90° in comparison with their traditional position. Previously the employees of Gidroproyekt asserted that due to this arrangement it would be possible to save millions of rubles since supposedly there would be no need to build a large production building. Now the specialists of the directorate and contracting organization are talking about the losses and inconveniences which appeared as a consequence of the turning. And at the plants of Minenergomash [Ministry of Power Machine Building] which manufacture the equipment, this has caused a breakdown. Certainly this required completely different "bends" in the infinite pipelines and a different placement of the assemblies and units. This was an unpleasant surprise for the supplier enterprises who, like a manna from heaven, look not for differences but rather standardization in the equipment of the nuclear plants.

Naturally, there must also be standardization in the sphere of construction methods for converting to assembly-line methods. Isn't it an interesting idea to divide the Smolensk AES into unique "blocks" or large units with a value of approximately a half million rubles each in order to create for their construction the preliminary planning calculations, the specifications for materials, structural elements and equipment and other documents which would become standard for subsequent plants?

Enticing? But A. Smirnov, the chief of the department of network planning and management at Atomenergostroyproyekt [?Nuclear Power Construction Design Institute] which is in charge of the technical support for the site, could also say a great deal of his "trials and tribulations." It turns out that these "blocks" were established, but it was impossible to complete the calculations due to poor contacts with Gidroproyekt. Some technical specifications still have not been provided. And where they do exist, the general designer has not assumed the job of breaking down the estimates. This must often be done when, for example, a certain pipeline or element runs through two or more "blocks." It would be unforgivable if two institutes of one department could not find a common language for the unit-by-unit breakdown of at least the next, second power unit of the plant.

As yet the organization of labor and production at the site of the Smolensk AES leaves much to be desired, although there have been certain indisputable achievements in recent months related to the arrival of the new chief of the site B. Reva and the great attention paid to it by Soyuzatomenergostroy [?All-Union Administration for Nuclear Power Construction] and the Minenergo. "Often at critical moments the construction workers forget about production methods," pointed out A. Petrunin, chief project engineer of Atomenergostroyproyekt. The cranes are used unsafely within the building. Without being ready they begin to install equipment, as happaned, for example, with a turbine in the turbine room. The construction brigades were endlessly shifted from less important sections of the project to more important ones, and from these to superimportant ones, and so forth.

In a word, it would still be premature to state that at present "a uniform standardized plan for an AES has been developed using preassembled and preassembled-site cast structural elements in all the basic installations" and that thus supposedly one of the main points has been carried out in the measures relating to a fundamental improvement in the construction of AES up to 1990 as elaborated by Soyuzatomenergostroy.... One must not console oneself with half-finished developments which are unsuited for assembly-line construction.

The problem of standardization is crucial both for projects with reactors of the RBMK-1000 type, and with others. Without solving it, the regional specialized nuclear power construction combines (AESK) which are being organized at present and designed, like the housing construction combines, to manufacture standardized structural elements with their subsequent installation at the plant sites, will be ordinary reinforced concrete products plants stiffled by a giant range of products and incapable of construction and installation operations. The pioneer of these enterprises, the Zaporozh'ye AESK, has been under construction since last year. Time is pressing to provide it with a standardized improved plan for an AES.

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CSO: 1822

PHOTO ON SAYANO-SHUSHENKSAYA GES POWER LINES

Moscow PRAVDA in Russian 4 Dec 79 p 1

[Photo and caption; photo by M. Petrov]

[Text] The large collective of construction workers on the Sayano-Shushenskaya GES is preparing to put the third unit of the GES on stream by 22 December, Power Day. Concrete is being laid and metal structural elements assembled around the clock and equipment is being installed.

[Caption] In the photo: The brigade of electrical installation workers of A. Martynov installs wire on the leads of the 500-kilovolt power transmission line.

ELECTRIC POWER AND POWER EQUIPMENT

BRIEFS

KOMI POWER LINE--Izhma, Komi ASSR. The 100-kilometer power line between Zelenoborsk and Izhma has gone on-stream ahead of time. The new power transmission line with a voltage of 110 kilovolts has provided a steady power supply to the interior agricultural regions in the lower reaches of the Pechora. [Text] [Moscow TRUD in Russian 29 Nov 79 p 1] 10272

CHEBOKSARY GES TURBINE--Cheboksary. The stator of the first turbine has been installed at the Cheboksary GES. The weight of this complex assembly in the power unit exceeds 150 tons. Installation has been started in the runner chamber. From Leningrad, the Ukraine, the Urals and Volga first-rate equipment is being received at the national shock construction project. [Text] [Moscow PRAVDA in Russian 2 Dec 79 p 1] 10272

ARMENIAN NUCLEAR PLANT--For a long time we waited to receive the full set of reactor equipment. Finally, on 2 November, we began installation inspection and assembly of the internal casing equipment of the reactor. The installation inspection showed that such essential equipment manufactured by the Izhora Plant had been delivered with major deviations from the plant blueprints. The detected flaws had to be eliminated on the spot and this lengthened the installation time. From 6 November the work of assembling the reactor was completely halted due to the lack of a technical solution for eliminating flaws on the bottom of the equipment. The same unseemly story occurred with a large assembly of the reactor, the upper unit, which was received very late from Izhora only on 2 November. We were to install it on 11 November, but this date was missed due to the fault of the supplier plant. During these crucial days before starting up, when each hour is precious, the directorate of the Armenian AES should promptly and efficiently provide the installation organizations with the lacking equipment, supply complete plant specifications and complete the assembly of the internal casing equipment of the reactor. The collective of the Kol'skiy section of Sevzapenergomontazh [?Northwestern Power Installation Trust], regardless of these difficulties, is fully determined to complete the work assigned to it on the reactor in the shortest time. E. Dauengauyer, chief engineer of the Kol'skiy installation section of Sevzapenergomontazh. [Text] [Yerevan KOMMUNIST in Russian 13 Nov 79 p 1] 10272

NEW LENINGRAD TURBINES--The hydraulic turbines serially produced by the Leningrad Metals Plant Association are called "clean" turbines. The enormous machines (the diameter of their runners is 10 meters) are equipped with an original system that excludes oil losses from the blade turning mechanism. Already the third such unit with a capacity of 80,500 kilowatts has been dispatched to the Nizhnekamskaya GES. A sterile system is not the only innovation achieved in this series of power equipment. For example, the efficiency has been increased up to 94.7 percent. This meets the highest world level for such machines. Made completely from stainless steel, the blades possess special strength against the destructive effect of the water medium. N. Koval'. Leningrad. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 22 Nov 79 p 2] 10272

NEW POWER LINE--Chelyabinsk, 22 Nov (PRAVDA correspondent F. Chursin). Power from the Reftinskaya GRES from Sverdlovskaya Oblast has been supplied to the Chelyabenergo [Chelyabinsk Power] system over a new 550-kilovolt power transmission line. The high-powered power route 237 km long has crossed industrial areas. It provides a more complete and reliable power supply for the towns and villages in the Southern Urals. A major contribution here has been made by the collective of the Uralelektroset'stroy [?Urals Power Network Construction] Trust, the personnel of the Kozyrevskaya substation and the relay service of the Chelyabinsk power networks. [Text] [Moscow PRAVDA in Russian 23 Nov 79 p 1] 10272

NEW MEASURING TRANSFORMERS--The Zaporozh'ye High-Voltage Equipment Plant has developed the output of the NKF-330 measuring voltage transformer designed for powering electrical meters as well as safety and signal circuits. The transformers employ standardized parts and assemblies analogous to those used in current transformers. This has made it possible to reduce weight, lower labor intensiveness of manufacturing and reduce the time for developing the articles. The new transformers are moisture and dust proof, and can be operated in different climatic conditions. The first batch of the new product will be sent to the Vyborg Power Plant and the Chernobyl' and Kola AES. Zaporozh'ye. V. Pedak. [Text] [Kiev RABOCHAYA GAZETA in Russian 21 Nov 79 p 2] 10272

MOSCOW HEATING LINE--The laying of the last, 300-meter section of the heating line which connects TETs No 25 and TETs No 12 has been completed. Now the 10-kilometer heating line is in full operation. Its route runs over the territory of Gagarinskiy, Kuntsevskiy and Kiyevskiy rayons. The residential districts in the area of Mosfil'movskaya Street and the Berezhkovskaya Quay have received additional hot water for heating and household needs. [Text] [Moscow MOSKOVSKAYA PRAVDA in Russian 9 Oct 79 p 3] 10272

BAM POWER LINE--Severomuysk (Buryat ASSR). Aviators of Eastern Siberia have helped in significantly accelerating the work of the electrical installation workers who are laying a 220-kilovolt power transmission line from the Ust'-Ilimskaya GES to the Severomuysk tunnel which is the largest

on the BAM [Baykal-Amur Mainline]. The use of helicopters in just playing out the wires has made it possible to shorten the time of the operation from an hour to 12 minutes. In the north of Buryatia the power transmission lines are being laid across the steep slopes of forested mountains. The swamps and numerous rivers are an impediment. Under such conditions ordinary equipment is not always effective and aviation has come to the aid of the construction workers. Helicopters deliver supports to the route and help install them. The cooperation between the pilots and installation workers is the guarantee that by the end of the year the power transmission line will reach the western portal of the Severomuysk tunnel. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 21 Nov 79 p 1] 10272

SIBERIAN SEWAGE TREATMENT--Magadan. The waters of Kolyma will become purer as the oblast's largest plant for the biological treatment of waste water has been put into operation. Along with the already existing similar facilities at th- Tal-Yuryakh Coal Mine, the station will purify all the production wastes of the coal industry enterprises. [Text] [Moscow PRAVDA in Russian 13 Oct 79 p 1] 10272

MOSCOW HEATING SYSTEM--The power workers of the TETs-23 have helped the flower raisers of Moscow in growing vivid statice and crysanthymums in the November frosts for holiday bouquets. New pipelines have been run to the hothouses which are supplied with heat from this station, and the uninterrupted supply of steam and hot water has been ensured. At the TETs strict control has been instituted over the work of all the units, and new equipment installed. This station supplies heat to all the northeastern rayons of the capital where more than a million Muscovites live. There will also be a partical of labor by the collective of the TETs in the holiday mood of those whom the power workers, in cooperation with the construction workers, helped accelerate the completion of new housing. The workers of the TETs ahead of time completed the network of pipelines running to the buildings which were erected ahead of schedule in Yuzhnoye Izmaylovo. The pipelines are dependably protected against frost by special materials. Heat losses have been minimized. The collective of the TETs-23, one of the largest heating and electric plants of Moscow, works efficiently and thriftily. The power workers celebrated the holiday of October with high labor indicators. The main one is the heat and flowers in our homes. [Text] [Moscow MOSKOVSKAYA PRAVDA in Russian 3 Nov 79 p 1] 10272

IRIKLINSKAYA GRES UNIT--The last, eighth power unit of the Iriklinskaya GRES has been put into operation. Its capacity is 300,000 kilowatts. With the starting up of the unit, the plant has reached designed capacity of 2.4 million kilowatts. (TASS). [Text] [Moscow STROITEL'NAYA GAZETA in Russian 5 Dec 79 p 1] 10272

CSO: 1822

UDC 622.692.4.076:620.197.6

COMPREHENSIVE ANTICORROSION PIPELINE PROTECTION

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 79 pp 6-8

[Article by A. M. Zinevich, director of the VNIIST [All-Union Scientific Research Institute on Building Trunk Pipelines]]

[Text] The best way to insure a long and reliable life of gas transporting pipelines is the improved quality of insulation, the timely introduction of electrochemical protection and an increase in the technical and organizational standards in the use of anti-corrosion protection.

In the general fight against corrosion, the protection of power pipelines, such as petroleum-gas pipelines, occupies a special place due to their importance and the way they function.

Our country has a powerful pipeline transport system 180,000km long. The area of the pipeline insulation surface is 450 million m^2. Over half the pipelines consists of pipe 1020 to 1420mm in diameter for a working pressure of 75kg-force/cm^2. Pipelines of larger diameters and higher pressures were built for the first time in the world for the highly corrosive ground conditions of the deserts in Central Asia, and the swamps and permafrost of Western Siberia and the Extreme North.

According to operating data, 90% of the gas pipelines have electrochemical protection. Regrettably, this data does not reflect fully the true protection of the pipelines. Numerous investigations indicate the unsatisfactory condition of the insulated covering on long and individual sections of the pipelines, as well as of the electrochemical protection. This is especially true of the Central Asiatic and Northern pipelines where there is no electrochemical protection.

To improve the comprehensive protection of pipelines, it is necessary to concentrate, first of all, on making better insulation and the timely introduction of electrochemical protection, as well as an

increase in the technical and organizational standards of using the means of protection.

These two main conditions for providing reliability are connected. The first is provided by the builders and the second -- by the operating personnel. Both follow from a single scientific base for the comprehensive protection of pipelines from underground corrosion. This base was created on the basis of theoretical and experimental investigations which facilitated the complete detection of the corrosion process mechanisms, the protective action of the coatings and cathode polarization which made possible the creation of scientific bases to protect trunk pipelines from underground corrosion and develop governmental and interindustrial norms. Their observance at the design, construction and operation stages will reduce failures due to corrosion to a minimum.

It is especially important to provide the integrity (continuity) and adhesion of insulation covering of pipelines. In investigating conditions of anti-corrosion protection of Central Asiatic gas pipelines (after five to six years of operation) by insulation with polymer tapes, it was established that, in a number of investigated sections (34%), there were technological and operational damages to the covering.

Technological damages (12%) is peeling, lack of laps, punctures, corrugations (incorrect tension of the tape). All this is the result of violating the technology in doing the insulation, laying and earth excavation and the moving (including the preparation of the trench beds, not padding pockets with soil, etc.).

Operational damage to covers (22%) are due to the formation of cracks, shift folds, corrugations and ruptures. These are caused by internal stresses, high temperatures, surface acting media, creeping or settling of the soil in contact with the insulating covers not protected by wrapping materials or with insulating covers that cannot withstand the shifting loads or the movement of the pipelines (especially, near valve units). In operation, it is necessary to maintain a constant (the lowest) temperature threshold and to tamp all formed pockets to avoid the settling of the soil over the buried pipelines.

It was also found as the result of investigations, that even with damaged covers (lack of continuity), the cover adhesion is satisfactory in individual cases (40%). At the same time, the undamaged cover has no adhesion (50%) in a number of sections. This may and does lead to corrosion damage, especially when protection voltage is insufficient. The causes of unsatisfactory adhesion are poor cleaning and drying of the pipeline surface, little or no priming, moisture (rain, snow) falling on the surface, the application of the tape wrapping on a wet primer, or is wrinkled or corrugated. All

this may be avoided if the builders respect the requirements for surface preparation and for the wrappings.

At the same time, it must be stressed that important operational factors to insure anti-corrosion safety are maintaining minimum protective voltage (under various operating conditions) and its continuity, as well as observing the proper temperature in operating the pipelines.

Thus, operating the pipelines without cooling the gas leads to untimely aging and cracking of the film wrapping, as well as increased corrosion damage when there is not the required level of protection potential.

Recently, special attention was given to investigating the temperature factor and its effect on the kinetics of the corrosion processes. The investigations made it possible to determine the changes in the speed of corrosion in soil media at temperatures increased to 100-120°C; the value of the protection voltage for various combinations of temperature and humidity levels; the diffusion characteristics of various covers and the thickness of the protective layer; the maximum allowable operating temperature of organic covers (polyethylene and polyvinylchloride) depending upon the length of the effectiveness of stabilitizing systems.

At the same time, studies were made of the mechanism of the metal-cover system adhesion ties and the effect of water and temperatures. This made it possible to evaluate various covers by such an important indicator as adhesion.

In connection with the considerably greater use of organic covers for pipelines when operating in various climatic zones, it became necessary to expand microbiological research. As a result, a preliminary evaluation of the biostability of the covers was made.

The enumerated complex of investigations made it possible to improve the passive protection of pipelines and to substantiate the concrete operational parameters of comprehensive protection.

The designs of the insulation covers were refined, a new efficient inhibiting primer for use under the insulation cover was developed and its production was organized at the Syran' Plant of the Minnefteg-azstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises]. A thermal-proof (up to 120°C) insulation tape made of silicon-organic rubbers was developed for the protection of sections of the pipeline, and its manufacture was begun. At the same time, thermal-proof radiation-modified insulation tapes using polyethylene are being developed with thermal resistance of up to 100°C.

The production of wrapping materials, bikarul and PDB [Paradichlorobenzene] was organized. They have better physio-mechanical properties than brizol [Bituminous-rubber waterproofing material]. A new wrapping material of low density polyethylene was developed that is second to none of the most efficient specimens abroad in its physio-mechanical characteristics. It must be stressed that new wrapping materials are being developed on the basis of study of the interrelationships between the strength and relaxation indicators in the field of elasticity, as well as by a new method for determining the shock strength.

The further improvement of bitumen base covers is being made by increasing the protective properties of the bitumen itself or combining it with polymers. An insulation mastic Isobitep (with TEP-DST-30 thermosoftening plastic polymer) was developed which has higher thermal, frost-proof and elastic properties than bitumen-rubber mastic. Certain results were obtained in developing, jointly with the VUKhIN [Eastern Scientific Research Coal-Chemical Institute] and the Ural NITI [Scientific Research Textile Institute], a coal mastic with an operating temperature of from minus 10 to plus 40°C. However, the development of technology for applying and manufacturing industrial covers is extremely slow.

There are successes in the investigation of inorganic covers -- metal and enamel-glass. Their technological effectiveness was improved. Essentially, the development of the horizontal enameling for pipe was completed. It may be used to insulate large diameter pipe.

Machines and devices for cleaning and insulating pipelines are being modernized further. It is necessary to accelerate the work on increasing the efficiency of the actuators of cleaning machines, drying ovens and devices for tensioning the tapes of the insulation machines.

The main direction in improving passive protection is to apply pipe insulation at the manufacturing plant or base.

In 1977-1978, on the basis of domestic developments and experience abroad, assimilation began of insulating pipe on a manufacturing scale at plants and using it when building pipelines. This made it possible to develop pipeline construction technology, including methods and facilities for insulating joints, repairing damaged covers, and equipment for transporting and installing insulated pipe.

However, the implementation of this basic direction lags impermissibly. Moreover, the required quality of pipe coated at the plant with epoxy paints and the technology of their application has still not been achieved. Up to the present, the builders are not provided fully with pipe precoated at the plant for building pipelines.

Much work has been done in the field of electrochemical pipeline protection. Protection criteria and ways for increasing the efficiency of cathodic polarization were determined, current distribution patterns under various conditions of pipe laying were investigated and new means for electrochemical protection were developed. A method and a device for measuring the polarizing voltage were developed as well as were new cathodic stations, anode grounding, drainage facilities and protectors, autonomous cathodic stations, extended protectors, automatic cathodic stations, etc. It is necessary to implement fully the most efficient developments and increase their reliability.

Work must also be accelerated in the area of providing means for monitoring the condition of the insulation covers (at the stage of insulation and installation work) and the degree of protection needed in the process of operation.

The following conclusions can be made on the basis of the investigations, the results achieved and practical experience.

The general trend in the area of passive protection of 1020 to 1420mm diameter pipelines is to manufacture pipe with insulating polymer polyethylene coatings (for operating temperatures of up to 60°C) and epoxy systems, as well as multiplying coatings of organic and inorganic materials. Welded joints must be insulated by covering them with polymer tapes, thermally stable materials or inorganic base materials.

Pipe with glass-enamel coatings, applied under stationary conditions, must be used to protect hot sections of pipelines.

To implement this trend (insulation applied at the plant), it is necessary to use multiple-ply polyethylene tape covers (for operating temperatures up to 60°C) and polyvinyl chloride (for a temperature of 35°C in combination with inhibiting primers and high-quality adhesive polymer wrappings.

Passive protection of sections of hot pipeline with temperatures higher than 60°C requires the use of thermally stable insulation tape based on radiation processed polyethylene and silicon-organic rubbers.

The insulation of up to 820mm diameter pipelines in the field should be done with bitumen-polymer armored coatings and insulation tapes based on polyethylene and polyvinyl chloride in combination with primers and highly adhesive wrappings.

Aluminum and zinc coatings should be used to protect pipelines from atmospheric corrosion.

The basic direction of developing means for electrochemical protection is in the comprehensive automation of processes that maintain the required protective voltage on pipelines. Automatic and semi-automatic cathodic protection devices made in a modular form (in northern and southern versions), must be used as well as extended protectors and long-life anode grounds, including deeply buried ones; and there must be remote facilities for monitoring and measuring the operating modes of protective means; and contactless monitoring of the continuity of insulation covers of pipeline sections completed by the builders.

In designing a pipeline, it is necessary to select methods of laying that eliminate its direct contact with highly mineralized, flooded grounds and highly corrosive media. In designing protection facilities, it is necessary to take into account the changes in corrosive conditions and ecological changes in the process of operation, as well as to foresee the possibility of cyclic shifts of pipelines; special measures should be taken to prevent mechanical damage to the insulation covers on these sections.

The temperature mode must be strictly observed in the process of operation and the required protection voltage must be maintained for concrete operating conditions on the entire length of the pipelines. Cooling the gas to the temperature of the ground surrounding the pipeline is a radical measure that increases the reliability and life of protection for large diameter gas pipelines.

Breathing life into the enumerated measures will make possible a sharp increase in the life and reliability of power pipeline systems.

2291
CSO: 1822

UDC 620.198/.197

NEED FOR CORROSION INHIBITOR DEVELOPMENT STRESSED

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 79 pp 9-11

[Article by A. I. Gritsenko, director of the VNIIgaz [All-Union Scientific Research Institute of Natural Gases] , B. I. Okhrimenko, department chief of the Mingazprom [Ministry of the Gas Industry]: "Anti-Corrosion Protection -- Basic Factor in Reliability and Life of the Gas Industry Facilities"]

[Text] The timely solution of the problem of comprehensive protection against the corrosion of the industry's facilities would increase sharply their reliability and would further strengthen the base for the successful fulfillment of the goals of the Tenth Five-Year Plan.

Mankind has been deeply concerned about the problem of fighting metal corrosion for a very long time. Its urgency has not diminished to this day. It is sufficient to note that at the present time, the total (direct and indirect) losses due to corrosion in the developed countries of the world amount to 10% of the national income.

About 20 to 25 years ago, our country spent about one tenth of its smelted metal to make up corrosion losses. Steel production has more than tripled since then, but its share spent for repairing or replacing corroded metal has not decreased, but increased. The uncontrolled increase in corrosion losses began to retard the further development of scientific-technical progress.

In 1978, in this connection, an anti-corrosion service was organized and the duty was imposed on the Government Committee on Science and Engineering to coordinate scientific research and experimental design work in the area of protecting metals against corrosion.

In April 1979, the Interdepartmental Scientific Engineering Council at the GKNT adopted a decision on developing and manufacturing a system of anti-corrosion measures for facilities that extract and transport gas.

The functions of the leading institute on protecting metals against corrosion at facilities for extracting, transporting, reprocessing and using gas were imposed on the VNIIgaz, and at facilities for sea deposits of petroleum and gas -- on the "Gipromorneft'" Institute.

A department of protection against corrosion and gas pipeline repairs, combining five laboratories, was created at the VNIIgaz. Measures are being taken to accelerate scientific research and the experimental design work further in solving the most important problems in the given area.

Electrochemical protection departments were organized at eight gas-transport associations.

The basic facilities in the gas industry to be protected against corrosion are -- gas trunk pipelines, operating wells, supply and utility lines and equipment of field installations, compressor and gas distribution stations, underground reservoirs and gas reprocessing plants.

While field and plant equipment is subjected basically to internal corrosion due to the presence of corrosive components (carbon dioxide, mineralized water, hydrogen sulfide) contained in the gas, gas trunks and supply lines are subjected to external (soil) corrosion that is the primary cause of considerable harm to the industry. The gas trunks are protected against soil corrosion comprehensively by the use of active (cathodic) and passive (insulation covers) protections.

Internal corrosion takes up a smaller share not only by reason of the small amount of metal used in gas extracting and gas reprocessing facilities, but also because there are no corrosive components in the gas at many deposits. When there are corrosive components in the gas, internal corrosion presents a considerable danger. At deposits in which gas contains carbon dioxide, hydrogen sulfide and mineralized waters, the equipment is protected by using steels which are resistant to hydrogen sulfide cracking, and corrosion inhibitors.

Inhibiting is one of the simplest and most efficiently economic methods for fighting corrosion. Inhibitors made it possible to put additional tens of billions of cubic meters of gas in operation in the country.

The development of efficient inhibitors required the joint efforts of a number of the country's large specialized scientific organizations. As a result of investigations done by the VNIIgaz and the Institute of Physical Chemistry of the AN USSR (IFKh AN SSSR), the mechanism of hydrogen sulfide corrosion was studied and scientific principles for developing corrosion inhibitors were formulated.

A comprehensive brigade of scientists from the VNIIgaz, the IFKh AN USSR and the VNII [All-Union Scientific Research Institute] of Surface Active Materials conducted tests on one of the developed inhibitors, the IFKHANGAZ, at experimental installations. In its protective and technological properties, it excels the best known inhibitors in the worlds.

A calculation of the economic effectiveness of the use of inhibitor IFKhANGAZ in the industry is that it can save over ten million rubles per year.

The VNIIgaz developed a special technological inhibiting composition ISGAZ-1 to protect against corrosion the internal surfaces of the UKPG-OGPZ [expansion unknown] gas pipelines carrying crude gas. The composition was introduced at all active sections of the 720mm diameter gas pipeline of the Orenburg complex. The economic effect of the introduction of the ISGAZ-1 reaches one million rubles per year.

Brand APS corrosion inhibitor was also introduced at the Orenburg gas-condensate deposit for protecting the sewage water utilization system at installations for comprehensive gas preparation. Its introduction at only one junction point of the refining installations made it possible to save 225,500 rubles per year.

At present, experimental-industrial tests are being completed of a new efficient I-25-D corrosion inhibitor developed by the VNIIgaz, the NIIMSK [Scientific Research Institute of Monomers for Synthetic Rubber] and the YuzhNIIgiprogaz [Government All-Union Institute on Designing Gas Pipelines and Gas Industry Enterprises in the South] jointly with the "Orenburggazdobycha" PO [Production Association].

The introduction of corrosion inhibitors at the Orenburg gas-chemical complex also solved the problem of protecting the environment to a great extent.

Certain results were achieved in developing special steels and alloys for manufacturing equipment and pipe resistant to hydrogen sulfide and carbon dioxide at facilities for extracting, reprocessing and transporting gas.

Thermally treated seamless pipe made of low-carbon steels (types 20St and 10St) were developed on the recommendations of the VNIIgaz and the TsNIIchermet [Central Scientific Research Institute of Ferrous Metallurgy imeni I. P. Bardin] and were introduced widely at the Orenburg deposit and at the Central Asia deposits. Four years of experience in operating the gas-collecting networks made of such pipe indicated their adequate resistance to cracking by hydrogen

sulfide. Their introduction at only the first stage of the Orenburg deposit had an economic effect of about a million rubles per year.

The TsNIIchermet together with the VNIIgaz, the VNITI [All-Union Scientific Research and Design-Technological Institute of the Pipe Industry] and pipe plants developed and manufactured experimental lots of pumping-compressor pipe strength category K and Ye made of type 18KhGMFCh steel. According to preliminary calculations, their use in the fields will save about 6000 rubles per well.

To protect against soil corrosion of large diameter gas trunks, especially in the highly corrosive grounds of the southern regions of the country, the VNIIgaz, jointly with the Minchermet and Minneftegazstroy, are working on developing scientifically substantiated requirements and specifications for pipe with insulation covers using epoxy powder composite materials filled with polyethylene or its copolymers of high density. Experimental-industrial tests in the process of refining the plant technology of their application are called for, as well as the development of recommendations on the use and operation of pipes with covers and the technical monitoring of their implementation.

A technical test is being done of the condition of polymer insulation on typical sections of existing gas trunks to study the speed of the aging of the anti-corrosion covers in various soil-climatic zones. New methods are being developed to monitor and forecast the service life of insulation covers of gas trunks. These methods will be tested under field conditions and in the experimental-industrial introduction of new coverings.

To optimize the work and increase the reliability of cathodic protection stations, they were reequipped with more modern series PSK-3 and PSK-5 3 and 5km converters. Their use in the industry saved about five million rubles.

The problem of providing faultless operation of facilities for electrochemical protection is being solved by the remote monitoring of these facilities. Since 1977, the VNIIgaz has produced TKZ-2M devices for remote monitoring the operation of cathodic protection stations using the gas pipeline as a communications channel. This produced not only continuous monitoring of the cathodic protection of the operation of the system, but also a considerable increase in the general technical standard of operation of the facilities for protection against corrosion.

At present, a still better system, the TKZ-4, for remote monitoring of multipipe gas lines was created. It was developed by taking into account the latest achievements of microelectronics and is being patented in a number of countries abroad. The design of the system

and the assimilation of production are being implemented by the "Soyuzgazavtomatika" VNPO [All-Union Production Association] under the guidance and with the participation of the VNIIgaz. The actual saving from introducing the TKZ-4 exceeds five million rubles.

The VNIIgaz provides great scientific and methodological help to industrial and produ ion associations. In particular, it developed a system of scientific-technical documentation that provides increased reliability against the corrosion of facilities in the industry, including an industrial standard on corrosion inhibitors used in the gas industry, recommended selections of materials, thermal treatment and the use of pipe for natural gas deposits containing hydrogen sulfide; provided a manual on operating facilities for the electrochemical protection of gas trunks, etc. In 1979, instructions were prepared on the order of primary accounting and preparation of reports on metal corrosion losses and the volume of means used for protection against corrosion at facilities for extracting, transporting and reprocessing gas.

Organizations and subdivisions of the industry are doing a considerable amount of work to increase the efficiency of protection against corrosion.

Systematic studies were organized of the corrosion condition of gas trunks, the condition of the insulation covers and facilities for electrochemical protection by the forces of production associations, design and scientific research institutes, as well as Orgenergogaz [expansion unknown] brigades, created especially for the comprehensive investigations of gas pipelines.

In order to increase the operating reliability of the gas transport systems preventive repairs are made on the line part of the operating gas pipelines, including repairs of insulation covers, with partial replacement of the pipe and full replacement of corroded sections with new pipe. At present, about 3800km of gas pipelines have been repaired.

In the period of 1974 to 1978, operating subdivisions of the Mingazprom repaired additionally about 4500 cathodic protection installations and built and repaired over 4500km of electric power transmission lines for feeding electrochemical protection facilities, and made capital repairs on about 500 cathodic protection and anode grounding installations.

At gas deposits containing corrosive components, and at plants where the gas is reprocessed, special services systematically monitor the use of corrosion inhibitors, the proper use and operation of pipe and equipment made of special steels, record cases of corrosion damage and take steps to increase the efficiency of the protection facilities.

A great amount of work is being done to equip electrochemical protection services with the necessary equipment and to strengthen them with skilled cadres. At present, most of the operating subdivisions are equipped with modern type PEL-EKhZ mobile laboratories.

Systems for remote monitoring of the operation of cathodic protection installations are being introduced systematically. At present, there is remote monitoring on over 5000km of gas trunks, including the Central Asia-Center gas transport system.

However, the enumerated measures taken by the industry to fight corrosion still do not solve fully this most important scientific-technical problem.

This is due primarily to the great complexity of the problems on studying corrosion and protecting metal structures. The actual corrosion-electrochemical characteristics of metals do not follow the classical electrochemical theory and in a complicated manner depend on the corrosion process itself. Fundamental research is required for a scientifically substantiated determination of criteria for corrosion danger and for forecasting the corrosion process. This problem can be handled by the All-Union Interindustrial Institute on Protecting Metals from Corrosion. It fulfills the functions of the leading organization in the country for developing methods and facilities for protection against corrosion. The largest problems in the gas industry on the solution of which depends, to a great extent, the higher reliability and efficiency of protection against corrosion of the industry's facilities are the following:

a considerable increase in the reliability of electrochemical facilities;

development and industrial assimilation of high quality insulation covers at the plants;

equip the industry with flaw detectors to monitor the corrosion condition of gas trunks 1020, 1220 and 1420mm in diameter;

manufacture equipment, devices and shut-off and regulating valves of materials resistant to hydrogen sulfide cracking;

assimilate widely industrial production of highly efficient and easy to manufacture corrosion inhibitors.

The intensive development of the extraction and transportation of gas poses for investigators new complicated problems in the area of protection against corrosion (corrosive cracking of pipe, protection of multiple-ply pipe, etc.), which requires an improvement in the coordination work, the strengthening of existing and creation of new subdivision on the industry, on an interindustrial scale. The subject matter of many scientific research and planning institutes of the industry does not take into account the increased requirements for protecting metals against corrosion.

A timely solution of the problem of comprehensive protection of the industry's facilities against corrosion will increase their reliability sharply and strengthen further the base for fulfilling the basic problem faced by the gas industry -- produce gas in 1980 in the volume specified by the basic directions of the development of the national economy.

2291
CSO: 1822

FUELS AND RELATED EQUIPMENT

UDC 620.197.3

CORROSION INHIBITORS FOR GAS FIELD EQUIPMENT

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 79 pp 13-14

[Article by N. Ye. Legezin, B. N. Al'tshuler, T. V. Komkhadze, O. G. Struyeyko (VNIIgaz [All-Union Scientific Research Institute of Natural Gases])]

[Text] The annual saving from the introduction of corrosion inhibitors at gas and gas-condensate deposits in the Krasnodarskiy Kray, Uzbek SSR and Orenburgskaya Oblast was over 5.5 million rubles or, on the average, 10,000 rubles per well.

Various methods are used to protect gas field equipment against corrosion, however, corrosion inhibitors are the most widely used for this purpose.

Inhibiting is one of the simplest, most efficient and economical methods for fighting corrosion. It does not require changing existing technological processes for extracting and transporting gas or additional equipment for industrial gas-extracting facilities being planned or already in operation.

Inhibitors that provide no less than 80% protection are used industrially at gas-extracting enterprises. At present, the use of corrosion inhibitors are specified in project plans and are actually used at all deposits in which gas contains corrosive components.

The efficiency and economy of inhibiting protection are determined by the proper selection of the brand of inhibitor, the method for introducing it into the well, the discharge lines and technological equipment. The corrosion inhibitor brand and its protective concentration are set for each concrete deposit on the basis of laboratory and experimental industrial tests.

At the same time, the stability of the inhibiting protection film depends on the nature of the inhibitor itself, the composition of the corrosive medium (the gas-liquid stream) and the operating mode of the equipment. If the film is not stable enough, it is necessary to constantly add certain portions of the inhibitor to the gas for its restoration. Under such conditions, the introduction of the inhibitor must be continuous. If the film stability is preserved for several days or even months, it is possible to introduce the inhibitor periodically.

Wells may be inhibited by introducing (continuously or periodically) the inhibitor into the space beyond the pipes, as well as pumping it into the stratum. In individual cases, a group of measures is used, consisting of periodic pumping of small amounts of the inhibitor into the stratum, as well as periodic feed of the inhibitor to the bottom of the well. For example, at the Orenburg gas-condensate deposite periodically, once in four months, 1200 liters of a 50% solution of the inhibitor in methanol are pumped into the wells, while at the same time, 80 to 100 liters/hour of an 0.25 to 0.5% solution are pumped continuously into the space beyond the well. From there the inhibitor through inhibiting or circulating valves gets into the gas stream and is carried to the loop gas pipelines. This method of feeding the inhibitor makes it possible to maintain its constant concentration in the carbon dioxide condensate. In the Orenburg deposit it averages 200mg/liter.

In the case where the underground well equipment does not have valves, the inhibitor is fed periodically into the space beyond the pipes or directly into the stratum.

The basic shortcomings of the indicated inhibiting methods are the nonuniformity of loss of the inhibitor with time and the dependence of loss on the yield of gas. Nevertheless, methods for pumping the inhibitor into the space beyond the pipes and into the stratum, being distinguished by their simplicity, are used widely, especially in sulfurous deposits of Western Uzbekistan and, with qualitative analytical, monitoring of the inhibitor content in the condensate shows good results in protecting pumping-compressor pipes against corrosion.

Intrafield (loop) gas lines used to transport gas together with the condensate to installations for preparing the gas or to the gas-treating plant, are protected against corrosion basically by the inhibitor which is carried out of the well and is present in the carbon dioxide condensate. Inhibiting by means of the gas-condensate stream is possible when the entire inner surface of the gas line is in contact with the liquid phase. This condition is met for plug

and annular structures of the mixture flow. Calculations made for actual loop pipelines at the Orenburg deposit indicated that annular flow modes are observed for gas-liquid flow velocities of three to five m/sec.

Large diameter (720, 1020mm) gas pipelines that carry natural gas from installations for comprehensive gas preparation to the reprocessing plants are protected against corrosion by applying an inhibiting film from a solution of certain viscosity, which is pushed along the pipeline by the gas by means of plungers (or one plunger). The viscosity of the inhibiting solution is about five to five cSt, the rated thickness of the inhibiting film is 100 to 120 microns, the actual consumption of the inhibiting solution is about 0.2 to 0.4m^3 per km of pipeline length. The pipelines are inhibited two to four times per year.

Individual sections of the technological equipment may be protected against corrosion by injecting an aerosol inhibitor into the system. The optimal size aerosol particles required for efficient inhibiting is from 5 to 50 microns.

It should be noted that the use of a highly efficient inhibitor must be combined with a properly selected method for introducing it into the protected system. Only this way is it possible to achieve fully all the advantages of protecting gas field equipment from corrosion by inhibitors.

By products of the petroleum chemical and refining industry obtained in the process of basic production are used, as a rule, as inhibitors in the gas industry. These include inhibitors used at gas-extracting enterprises on a commercial scale: IKSG-1, KO (for carbon dioxide corrosion), ANPO and I-1-A (for hydrogen sulfide corrosion).

The VNIIgaz developed special technological requirements for corrosion inhibitors -- the inhibitor must protect the metal from general corrosion, prevent the absorption of hydrogen and sulfide cracking. Moreover, at high temperatures and pressure, it should not polymerize or cause gumming of the commercial product, foaming of the absorbents, drying, and should not be toxic.

Corrosion inhibitors are improved mainly by improving their technological properties and by increasing their ability to protect metal not only against general corrosion, but also against sulfide cracking.

Investigations on the development and the making of new corrosion inhibitors are being done by the VNIIgaz, the VNIPIgaz [All-Union Scientific Research and Planning Institute for Gas], the YuzhNIIgaz [Government All-Union Institute on Designing Gas Pipelines and

Gas Industries] , the SredAzNIIgaz [Central Asiatic Scientific Research Institute of Gas Industry] and the SevKav NIIgaz [Northern Caucasus NIIgaz] with the participation of specialized institutes, the NIIMSK [Scientific Research Institute for Monomers for Synthetic Rubber] and the IFKh [Institute of Physical Chemistry] AN USSR.

Several new efficient and easily manufactured inhibitors and inhibiting compositions were already suggested to industry. Thus, for example, ISGAZ-1 inhibiting composition was introduced at the Orenburg deposit for protecting the UKPG [expansion unknown] - GNZ [Gas Refining Plant] gas pipelines, while inhibitors Donbass-1 and 1-25-D are used for protecting gas field equipment. Providing an 85% and more efficiency of protection of the equipment from general corrosion, they differ favorably from previously used inhibitors by their technological properties. The use of these inhibitors permits reducing the speed of general corrosion to 0.05 - 0.1 mm per year.

The practice of working natural gas deposits containing hydrogen sulfide and carbon dioxide indicated that special corrosion inhibitors should be selected for individual sections of the technological line for preparing and reprocessing gas. Thus, the APS inhibitor was developed for protecting the sewage water utilization system. Corrosion at the Orenburg field was reduced to 0.15mm per year.

The VNIIgaz developed and introduced jointly with the IFKh AN USSR a highly efficient IFKhANGAZ-1 inhibitor-antifoaming agent. By providing protection against general corrosion and a tendency to absorb hydrogen by metal, it reduces to a fifth the carrying away of sulfur with the gas. The inhibitor demonstrates its best protective properties in strongly corrosive aciduous mineralized media with low pH values at high concentrations of hydrogen sulfide.

The IFKhANGAZ-1 was introduced at the Mubarekskiy GPZ and the Pokrovskiy KS [Compressor Station] . The use of the inhibitor at the compressor station permitted a reduction in the speed of corrosion to 0.01-0.05 mm/year and the use of ordinary equipment for gas compression.

The norms for inhibitor consumption in specifications are expressed, as a rule, in milligrams per liter of carbon dioxide condensate, extracted from the well, or in inhibitor kilograms per million m^3 of extracted gas. Taking into account the accumulated data on using various corrosion inhibitors, it may be considered that the industrial norm for inhibitor consumption is 15 to 30kg per million m^3 of processed gas.

The widely organized production of new efficient and technologically effective corrosion inhibitors saves millions of rubles for the national economy.

2291
CSO: 1822

UDC 622.245.14;622.276.038

GEOCHEMICAL LOCATING OF GAS ZONES

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 79 pp 30-31

[Article by V. N. Kortsenshteyn (VNIIgaz [All-Union Scientific Research Institute of Natrual Gases] : "Geochemical Locating of Productive Gas-Bearing Zones of the Orenburg Deposit"]

[Text] The proposed method makes it possible to detect with adequate accuracy gas-bearing zones of various production zones according to the distribution data of hydrogen sulfide in the gas of the Orenburg gas-condensate deposit.

The establishment of the features of the most productive gas-bearing zones in the Carbonaceous massif of the Orenburg deposit depends to a great extent on knowing the patterns of the zonal distribution of the fields of porosity, penetrability and block disintegration. However, the direct determination of the spatial orientation of the indicated zones, which differ considerably in their volumetric parameters (within the boundaries of such a large Carbonaceous massif), is very complicated, cumbersome and at times impossible. This cannot be done either by direct study of core samples from wells, or by hydrodynamic methods in any conceivable network of wells. Such methods are unable to detect the zonal nature of the distribution of the collector and dense strata in the Carbonaceous massif as a whole.

An easier solution of the problem is to study the distribution of some specific natural indicator within the gas filling the porous space of the collector strata which differ noticeably in their volumetric parameters.

Such a natural indicator must, first of all, differ sharply from the basic component of the gas mixture in its physio-chemical properties to insure its authentic detection. Moreover, the indicator must be chemically inert to the rocks of the gas-containing medium. We

proceed on the basis of the unity of the mechanism and the dynamics of the generation of the considered indicator in each collector zone or blocks of the deposit.

Hydrogen sulfide meets all the above requirements at the Orenburg deposit.

Certain features of the data on the hydrogen sulfide concentration according to investigations of single wells merit attention. As shown by experience, for the Orenburg deposit conditions, this data is most frequently typical not only for spatially limited sections, but is also true for wider zones. Therefore, the data was adequate even at the initial stage of exploration of the deposit to obtain the results of the investigation on a sparse network of wells in order to judge the probable concentration of hydrogen sulfide within significant zones and to evaluate, by this data, the features of the disposition of the basic gas-containing collector blocks within the deposit.

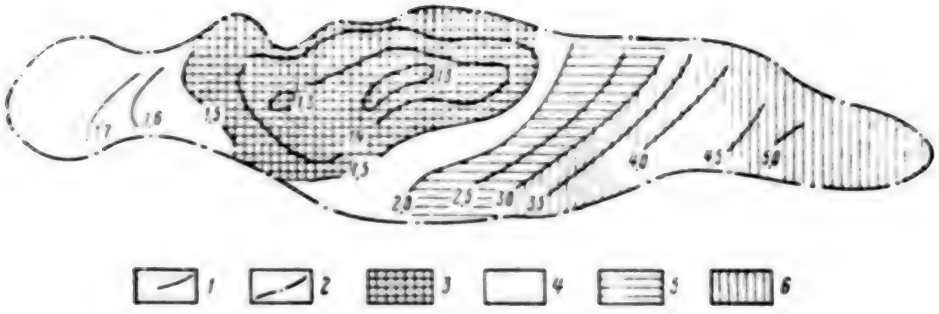
The Orenburg deposit gases differ considerably in their composition from other gas and gas-condensate deposits of the Soviet Union by the complexity of the gas components, as well as the nonuniformity of distribution within the productive level.

Studies of the composition of the gas in the basic bed of the Orenburg deposit indicated that the amount of hydrogen sulfide varied within 1.3 to 5%.

The following zoning was established in the regional plan: the content of hydrogen sulfide in gas was 1.5 to 1.7% in the western section; 1.3 to 1.7% in the central section; and 4 to 5% in the eastern section.

It is necessary to analyze, first of all, the geochemical studies made before the working of the deposit began. In this case, they are of the greatest interest, inasmuch as at that time, there were no flows of gas from zones with various volumetric parameters that, as a result, would distort the sought for patterns of natural inhomogeneity of hydrogen sulfide distribution (as well as of other components) in the productive strata of the central zone of the deposit were established in [3].

The concentration of hydrogen sulfide along the vertical in this zone is almost strictly linear. Only near the gas-petroleum or gas-water contact, do concentrations of hydrogen sulfide increase exponentially which is due to the effect of petroleum fringing.



Distribution of various productivity zones according to data of geochemical location of the productive cross section of the Orenburg deposit (prepared by V. N. Kortsenshteyn).

1 -- H_2S concentrates along the surface of the equidistant roof of the Artenian [?] stage and the upper boundary of the precontact zone (according to Yu. A. Zhurov); 2 -- gas-bearing contour. Distribution of various productivity zones; 3 -- very highly productive (possible well yield of up to a million m^3/day; 4 -- highly productive (up to 750,000m^3/day); 5 -- medium productive (up to 500,000m^3/day); 6 -- low productive (up to 200,000m^3/day).

Thus, by analogy to the center of the Orenburg deposit, it may be assumed that as the distance from contact with petroleum or water increases, the hydrogen sulfide concentration along the vertical in corresponding zones must decrease first exponentially and then linearly. Using this data and the experimental relationship, Yu. A. Zhurov prepared a map of hydrogen sulfide concentrations along the roof of the Artenian stage as of 1976 [3].

The main conclusion following from interpreting A. K. Karpov's and Yu. A. Zhurov's maps [3, 4] is, that for the conditions of the Orenburg deposit, data on the percentage content of hydrogen sulfide in the gas mixture makes it possible to give a comparative qualitative characteristic of the gas content of the collector strata. The basis of this evaluation is the inversely proportional relationship we established between the percentage content of hydrogen sulfide and the unit gas content in the collector strata: the lower the percentage of hydrogen sulfide in the basic carbon dioxide mass of the gas

mixture, the higher the gas content of the collector strata and their piezoconductivity in a given zone. Zones with comparatively high concentrations of hydrogen sulfide will have a comparatively low gas content.

We considered the theoretical basis for this relationship previously. We will note here only that the inverse proportional relationship between the concentration of hydrogen sulfide and the unit gas content of the collector strata is based on the effect of dilution. Inasmuch as the absolute concentration of the carbon dioxide component of the gas mixture that plays the role of the diluent, is two orders of magnitude greater than the hydrogen sulfide content, any increase in the concentration of carbon dioxide will unavoidably result in a corresponding reduction in the relative concentration of hydrogen sulfide.

Concerning the physical essence of the considered relationship, it should be stressed that it is due to the peculiar inhomogeneity conditions of the producing collector strata and the isolation of their individual components by shields (tectonic, lithologic-facial). Under such conditions, spatially isolated gas-saturated zones, whose resources are high, must be distinguished by lower concentration of hydrogen sulfide compared to zones with lower resources of carbon dioxide that plays the role of a diluent. If, however, the various zones are not adequately shielded from each other, the considered effect will not be manifested clearly enough. During the long geological age, concentrations of hydrogen sulfide unavoidably even out in such adjacent zones by virtue of diffusion and effusion laws, independently of the volumetric parameters of the gas-containing formations.

The location of the most productive gas-bearing zones in the Carbonaceous massif of the Orenburg deposit is shown in the Figure.

The geological-geochemical analysis cited above confirms the conclusions previously made by the author that the productive plan of the Orenburg deposit is partitioned into individual zones with autonomous geochemical modes.

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2291
CSO: 1822

FUELS AND RELATED EQUIPMENT

SPACE METHOD OF GAS EXPLORATION

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 79 Back cover

[Text] A space photograph is an objective reflection on its surface of the actual subsurface of the earth.

The basic problem of decoding is to recognize, on a space photograph, the outlines of the structural traps and the special features of their formation.

Systematic decoding of space photographs of a number of gas-bearing and promising gas-bearing regions in Western Central Asia detected over 20 formations a part of which was identified with buried local upheavals with adequate assurance.

Comprehensive processing of space photographs makes it possible to:

detect and outline buried local upheavals that promise to contain gas;

outline known local upheavals more precisely including those that contain gas deposits;

trace zones of rupture dislocations associated with buried local upheavals that promise to contain gas;

study the special features of the block formation of local upheavals with intensely ruptured disclocations.

Developed by the VNIIgas [All-Union Scientific Research Institute of Natural Gas].

2291
CSO: 1822

THE WATCH-FIELD METHOD OF WORK

Moscow NEFTYANIK in Russian No 10, Oct 79 pp 4-7

[Article by nonstaff correspondent Yu. Perepletkin: "The Watch-Field Method--Success Depends on Organization"]

[Text] The drillers of the Belorussian UBR [Administration of Drilling Operations] drilled 43,200 meters of wells on Tyumen' lands during the first six months of 1979 compared to a planned 37,500 meters. Our nonstaff correspondent Yu. Perepletkin tells how this collective is working.

The oil workers of Tyumenskaya Oblast are faced with a crucial problem during the fourth year of the five-year plan: deliver 275 million tons of oil and gas condensate to the country's national economy. Well drilling should be developed at advanced rates to solve it.

"I was greatly interested," noted General Secretary of the CPSU Central Committee, Chairman of the Presidium of the USSR Supreme Soviet Comrade L. I. Brezhnev in his greeting to the workers, engineering and technical personnel and employees, party, trade-union and komsomol organizations of the Nizhnevartovsk UBR No. 1 and the Sergut UBR No. 2 of Glavtyumenneftegaz [Tyumen' Main Administration of Oil and Gas], "in learning about the difficult achievements of your remarkable collectives in the socialist competition for the maximum high indicators in drilling and putting oil wells into operation. Your collectives are successfully fulfilling and overfulfilling the established tasks on well drilling under severe natural and climatic conditions." Leonid Il'ich approved the desire of the leaders to take the planned positions by using leading methods of labor, intensification of production processes, more complete use of internal production reserves and further improvement in organization of the socialist competition and also expressed confidence that their initiative will receive widespread support in other collectives.

Drillers from Kuybyshevskaya Oblast, Tatariya, Belorussia and the Ukraine are working shoulder to shoulder with the Tyumen' workers in their struggle

for more oil. They are operating in the Central Ob' area by the watch-field method, have become their own people in this inhospitable land and have learned to counter the caprices of nature with firmness, resourcefulness and sharp wits. The Belorussian Administration of Drilling Operations, which is headed by Stepan Pavlovich Mazurok, has accustomed itself and become stronger on the Tyumen' lands. For example, the oil drillers from Belorussia went through 12,100 meters of rock compared to a planned 7,500 meters and 11,000 according to socialist pledges in May, disregarding unprecedented high waters, interruptions in energy supplies and other interference.

Several days spent in Nizhnevartovsk among the workers of the Belorussian UBR and numerous meetings and conversations with managers of the enterprise and common workers--drillers and derrick installers and transport and supply workers permitted one to largely understand and reach the main conclusion: the specialists from Gomel', Rechitsa and Svetlogorsk came to the Tyumen' lands as other than visitors and guests. They came with serious intent and for a long time. An indication of this is the businesslike attitude of the drillers and the thrifty organization of operations thought out to fine details and the serious determination with which the new residents are arranging themselves on the edge of the city. Only a few rail cars are now standing here, but the outlines of future buildings are already being planned. And right alongside is a swamp, but it will soon retreat and the base of the Belorussian drillers will receive a reliable pass.

For the time being, everything here reminds one of an operational headquarters. The chief of the shift of the central engineering-production service G. N. Shnypko, contacting the Association Nizhnevartovskneftegaz, loudly calls the names, looking over the list of people who must be taught controlled directional drilling. The manager of the production section Yu. F. Krasheninnikov is compiling the indicators of the brigades to determine which collective needs help first and what kind of help it needs. People come into the rail car and, having received their task, leave--drivers, carpenters, welders and installers. B. S. Gaziyants, the chief engineer, is rushing in his vehicle somewhere on urgent business.

Stepan Pavlovich Mazurok Comments:

"Many of us became acquainted with Siberia three years ago when the Belorussian derrick installers helped the arctic workers to install the drilling rigs at the Fedorov and Lokosovskoye fields. I was entrusted at that time with managing the derrick installation office. And I worked several years prior to this in Tatariya where it was also hard. So that there was already some psycholoical readiness for the transfer. And even so, when they called me into the Association Belorusneft' and told me that a UBR would be especially created to work in Tyumenskaya Oblast, this was something to think about. After all, this is not a temporary duty, but an essentially new matter. And they also said that I was entrusted with

creating the administration: after all, you do have experience--you were both a drilling foreman and chief engineer and you headed the derrick installation office. I took the paper with the order printed on it, put it in my pocket and showed it to my wife at home. She understood. If you have to go, then you have to go."

This was on 11 November 1978 and within one month people had been mainly selected for the new UBR and in December the Belorussian Administration of Drilling Operations had begun to work.

'What I wanted to say, that the beginning was very difficult: we after all "arrived" in winter. December and January were extremely severe. And although they assisted us here at Nizhnevartovsk with advice and matters, everything would have been unsuccessful without our own help. However, as they say, every cloud has a silver lining--we passed the severe winter exam and now we will not begin drilling without having a water well, we will not risk settling in rail cars that lack insulation and we will not permit the solution to be left in the manifolds and freeze. We learn from our mistakes."

"We were supposed to drill 3,000 meters of wells in January, but we drilled a little more than 1,000, we fulfilled only half of 5,000 wells in February and we also lagged behind the schedule in March. But this was a time when our home base was being developed at full tilt. Understanding that, being "dependent" on the arctic workers, we will not take advantage of the tangible benefits, we strengthened our own derrick installation shop, completed the transport subdivision and organized supply. We came on schedule in the spring and soon we were able to assist the local drillers in installation and shipments. We now have approximately 60 machines and tractors, including the K-700, the Uragan with platform and others and means of freight transport especially needed under local conditions. A total of 90-95 percent of the machines go out onto the line daily. We are equipping the shops so that this indicator does not decrease. We do not run to our neighbors for each bolt."

It is 0800. Everyone is performing their details. The managers of the services are reporting about the results of yesterday's work and are planning today's work. Almost two weeks remained until the end of May and only 320 meters is left to fulfill the monthly drilling task. According to all data, 350 meters should be drilled tomorrow. However, those assembled are far from complacent. First, they took on additional pledges for May and second, the situation is becoming more complicated with each day. There has been non-flying weather for a week already and it is time to change the watch. There is only one route--by air--to the Potochnoye Field where two of four watches are operating. It is even more difficult to reach the Vatinskoye Field--the rivers and streams are literally overflowing in front of your eyes and pipe, cement and provisions must be delivered to drilling clusters No. 38 and No. 46.

"We have to get in touch with the Megion drillers," the suggestion is offered. "Find out what measures Kamalov is undertaking. Our situation is the same."

This is a good idea. The Belorussian drillers who signed up for the Tyumen' lands maintain permanent business contacts with the local drillers. This contact brings mutual benefits.

Stepan Pavlovich Mazurok Comments:

"Last year when we were drilling at the Potochnoye field, A. Ya. Mironov's brigade from the Megion UBR was working alongside. Our fellows were frequent guests of them. They observed, asked questions and learned. Not only did they not conceal any "secrets" from us, but on the other hand, helped everyone in whatever way they could. The same situation is now at the Vatinskoye field. The chief of the Megion UBR N. G. Kamalov is not only well acquainted with our drilling foremen (and there are two each of them per brigade during watch-field drilling), but he looks over the summary each morning and is interested in the indicators. And when we needed specialists in controlled directional drilling, he sent his best technicians, Vladimir Samarskiy and Aleksandr Baranov, although the Megion workers needed these people themselves."

"Relations with the local drillers and with the Association Nizhnevartovskneftegaz are generally an important and serious problem. The fact that we are standing rather firmly on our own feet today is largely due to the Siberian workers. We receive important and constant support from workers V. A. Murzin, S. P. Afanas'yev and Ye. S. Razumenko of the association. Direct contacts with the chief of the Drilling Administration of Nizhneneftegaz Yu. A. Aladzhev essentially permitted us to remove all the acute problems related to drilling. The stock materials--drill strings, chemical reagents, cement and so on--are now shared absolutely equally per meter of well, regardless of whether they come from "our own" UBR or "from the new arrivals." The people who manage drilling problems at the association understood earlier than the others that we are not "foreigners" and that we are working in common with the arctic workers. It is simply necessary that the other services of the Association Nizhnevartovskneftegaz assimilate this."

"We are living not only for today. We are thinking about the future. Besides the four existing drilling brigades, we will also staff and outfit two additional brigades with machine tools during the summer. We are drawing on our rear forces for this purpose. We are constructing a saw frame at the Potochnoye field where we think it is feasible to drill in winter. This will help to construct the drilling mud laboratory and to deliver comfortable houses for the drillers."

"It may seem strange, but I question my subordinates in the third unit about yesterday's drilling, although this is very important. I questioned them

primarily about how the derrick installers are working. If there are no machine tools, forward motion will stop. I am then interested in development of the base at Potochnoye field--if a front of operations for the future is not prepared, the collective will be idle beforehand."

An even more important prerequisite for successful work is attention to people. Concern about the needs of the drillers is the main thing. Here is a typical example. A. V. Mnatsakanov, the deputy general director of the Association Belorusneft' for Drilling recently called and his first question is about how construction of the bath at Vatinskoye field is proceeding, rather than about the number of meters drilled.

I am familiar with the "romanticism" of tent cities. But when it is possible to create normal working and living conditions for people, they must be created--even more so in the tayga and tundra, among the swamps and in severe cold.

A small stream Vatinskiy Yegan overflowed so that the guard rails of the metal bridge are hardly visible somewhere among the boiling stream. The route to the Belorussian and Megion drillers is cut off. Several machines have accumulated on both banks. Only amphibious all-terrain vehicles dare cross the obstacle: driving a foamy bow-wave in front of them, they reach the bridge flooring concealed by the river and when it stops they again go into the water. Their caterpillar tracks again reach the bottom.

Boris Surenovich Gaziyants is sitting in one of the Ural vehicles. The driver understands him without words. The vehicle, loaded with materials for the drillers, carefully, almost unwillingly, heads for the bridge. The cold streams rush around the wheels. It becomes deeper and deeper. But here is the bridge. The Ural vehicle overcomes the invisible bottom of the Vatinskiy Yegan in the flood, but the driver slows down near the end of the flooring. It is still a long way to shore. Gaziyants encourages him: give it a try. The all-terrain vehicle floated here for only an instant and again travelled along the bottom. This means that it isn't very deep.

The Ural tilts forward sharply. There is water in the cab! But the vehicle is already confidently moving toward the edge of dry land. The chief engineer says with satisfaction: "You see! You can cross it." "Today I can," agrees the driver. "Tomorrow will be impossible. The water will cover everything."

This day they managed to deliver six large-capacity trucks of cement and everything needed for work to drill in Cluster No. 38 of the Vatinskoye field. The drilling did not stop.

Stepan Pavlovich Mazurok Comments:

"The meters of drilling is one of the most important indicators of our activity. However, I am deeply convinced that any success, like any

failure, depends not only on the production plusses and minuses, but to a lesser degree--perhaps even to a greater degree--on working with people. Creation of this labor collective and education of the workers in the entrusted matter is our general line!"

"The complications related to the high waters, shortage of helicopters, interruptions in supply and absence of operational communications are now misfortunes common to all drillers of the Ob' area. But there are amazingly different indicators in the summary reports. I feel that complete collectives welded together by a common goal are capable of overcoming the difficulties most effectively. It is necessary that everyone down to the last man understand the responsibility of the season. And this means that explanatory work should be carried out every day and every hour. More than 30 communists are now working in the most decisive sections and are agitating with their personal example."

"When the administration had only been created, we became thoroughly familiar with each one who wanted to travel to Tyumenskaya Oblast and we became familiar with his aspirations, hopes and plans. I placed my bet on the young people. I am always glad to work with these active people. I believe in young people, in their energy, persistence and enthusiasm. And almost all the key positions in the UBR are occupied by people who have been working for only 5-6 years after graduating from the institute. They include the chief engineer Boris Gaziyants, chief mechanic Stepan Mel'nik, the chief of the central engineering-production service Miron Sidorak and drilling foremen Yevgeny Dorash and Roman Shtoyko. Roman, incidentally, a geologist by education, applied for a job as drilling foreman while still at Rechitsa, but they released him. And here we took a risk: even if he is a mining engineer-geologist, things will go fast and he knows how to work with people. And we were not mistaken: Roman literally became a firm part of the collective, inspired the workers and his brigade is one of the best. Incidentally, not everything in the administration is going smoothly. Take Leonid Gusev's brigade, who with Dorash has been working at the same field. The drillers come to the job by the same type of transport, have identical equipment at their disposal and receive all materials equally. But Dorash has drilled 12,000 meters of wells, while Gusev has drilled only 6,000 during the same time. Why? This is information to think about. Obviously not only the foreman here is guilty, but we have overlooked something. Of course, there is nothing to be said about some correction of the lagging brigade's plan. Having found a weak spot, the collective is obligated to fulfill its task."

There are also other open questions. The assimilation service is also operating poorly. The drilled wells must be turned over for operation immediately, without losing a single day, but they are quite often standing idle. There are interruptions in organization of labor. An entire drilling brigade stood idle for eight hours recently through the fault of our worker, having lost at least 400 meters of drilling. We equate idle times through our own fault to accidents and to an extraordinary event. The

percentage of production time should be maximum, approaching 100. After all, when a brigade is at the site, the watches must be brought from their living quarters to the derrick and returned. Is it permissible to lose time if everything necessary for drilling is available?

I have already said that communists and komsomol workers are the support and basis of the collective. We recently consulted with the secretary of the party organization Vladimir Timofeyevich Kovalkin about the agenda of the next meeting. It was simply necessary to talk about the results of the spring season and to discuss the strategy of the "summer campaign." But the party bureau decided at its own meeting to listen to communists responsible for educational work among the drilling brigades. Our komsomol organization is growing constantly. There are now more than 120 VLKSM komsomol members in the administration. This is a large force!"

"Development of the Central Ob' region has become a matter of primary importance for us Belorussian drillers. Utilizing our own experience and taking the best from the Siberian workers, we are attempting to do everything to cope with the state task and our pledges."

And again the details are being carried out. Despite the fact that the monthly plan has already been overfulfilled, everyone is tense. The conversation in the office of the Belorussian UBR reminds one of a military council. The situation has become critical. Although they expected the high waters, the scope of the flood surpassed all calculations. People are being brought on rafts from drilling cluster to drilling cluster at the Potochnoye Field. The drillers at the Vatskaya area also found themselves in a difficult situation--no transport of any kind can now reach them. And the weather does not permit helicopters to fly.

"First, comrades, we should understand that the water is not only approaching us," S. P. Mazurok says softly. "We cannot count on help from the outside and possibly we ourselves will support someone. Everyone knows the situation. Who has a suggestion?"

Within 30 minutes the representatives of all the services began to leave the "staff" rail car. One could guess by their intense faces that the decision had been made and that it would not be simple to implement it. The vehicles left the town of the Belorussian UBR one after the other. Each one was heading out to perform his part of the task.

The severe winter, the spring season of bad roads and then the high waters. These are serious tests for the drillers who have come to the Tyumen' lands. But there are no doubts: working shoulder to shoulder with the Tatar, Ukrainian and Tyumen' oil workers, they will pass the most difficult exam with honor.

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CSO: 1822

PROSPECTS OF CONTAINER HYDROTRANSPORT

Moscow NEFTYANIK in Russian No 10, Oct 79 p 29

[Article by A. Feygin, Goskomnefteprodukt of the RSFSR]

[Text] A scientific and technical seminar on the topic "Container Hydrotransport of Goods Through Major Pipelines," organized by Goskomnefteprodukt [expansion unknown] of the RSFSR, the Central Board of NTO NGP [Scientific and Technical Society of the Petroleum and Gas Industry] imeni I. M. Gubkin and by the pavillion The Petroleum Industry of VDNKh of the USSR, was held in July at VDNKh of the USSR. A special topical exhibition devoted to this important and timely problem was organized. During the past few years a large complex of theoretical, experimental and experimental-design work in the field of development and introduction of container hydrotransport of goods through major pipelines was carried out by the SKB [Special Design Office] Transnefteavtomatika jointly with MINKh i GP [Moscow Institute of the Petrochemical and Gas Industry imeni Academician I. M. Gubkin] and a number of scientific research and design organizations in creative cooperation with pipeline transport workers of Goskomnefteprodukt of the RSFSR and Minnefteprom [Ministry of the Petroleum Industry].

It was noted in the report of the head of the department of the SKB Transnefteavtomatika M. E. Shvarts "The Status and Prospects for Development of Container Pipeline Hydrotransport in the USSR" that theoretical bases of pipeline hydrotransport of goods have now been created, rubberized elastic fabric containers for one-time and multiple use for petroleum product transport have been developed and have undergone trials on the major pipelines and equipment for starting and reception of containers and monitoring their passage through the pipelines has now been created and manufactured. Devices for packaging highly viscous petroleum products in containers have been developed at the petroleum refining plants.

It was emphasized in the report that introduction of container hydrotransport of goods will increase the utilization factor of incompletely loaded major oil and product pipelines and will reduce expenditures for transport of goods by rail, truck and water. The nomenclature of goods transported through pipelines will be expanded with introduction of pipeline container

hydrotransport, continuous delivery of them from enterprises of the petroleum refining and petrochemical industry to consumers will be organized, expenditures for handling of goods will be reduced and environmental pollution by petroleum products will be reduced.

Experimental transport of containers with goods in the flow of pumped fluid, carried out on the major pipelines, confirmed the correctness of theoretical investigations and experimental developments.

Representatives of the SKB Transnefteavtomatika, MINKh i GP imeni I. M. Gubkin, the Novopolotsk Polytechnical Institute, IGM [Institute of Mining Mechanics] of the Ukrainian SSR Academy of Sciences, TsNIL [Central Scientific Research Laboratory] Polimerkonteyner and others presented communications and reports on development of the theoretical fundamentals of hydrotransport of goods, on development of specialized flexible containers of synthetic materials resistant to the prolonged effect of oil and petroleum products, on ultrasonic apparatus to monitor the passage of the containers through the pipelines and on outiftting the petroleum and product pipelines with equipment for starting and receiving the containers. Representatives of the Leningrad Regional Administration of Major Product Pipelines of Goskomnefteprodukt of the RSFSR and the Novopolotsk Administration of the Druzhba Pipeline of Minnefteprom talked about the results of experimental transport of goods in flexible containers through the major Kirishi-Leningrad product pipelines and through one of the sections of the Druzhba oil pipeline. The economic aspects of introducing pipeline container transport of goods were considered in the speeches of representatives of the SKB Transnefteavtomatika and Novopolotsk Polytechnical Institute.

The seminar adopted a decision which contains specific recommendations on further development of scientific research, planning-design and experimental-industrial work and extensive introduction of hydrotransport of goods in pipeline transport.

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CSO: 1822

FUELS AND RELATED EQUIPMENT

CONSTRUCTION RESERVES IN SIBERIA

Moscow NEFTYANIK in Russian No 10, Oct 79 pp 36-37

[Article by M. Umanskiy, Tyumen'-Nadym-Urengoy]

[Text] We have been waiting for the second day at Tyumen' airport for an air "clearance" to the north of the oblast, from where the blustery wind rolled ever newer and newer waves of rain. And when finally the weather opened up a sunny window for a short time, the air vessels of gas workers, builders and geologists immediately made use of this. The aircraft on which we flew had consignments on board for the school under construction at Pangody, desks for the kindergarten, products and various other goods, delivery of which would not tolerate a delay.

Looking at the endless swamps stretching below to the horizon and at the countless lakes covered with ripples, it was difficult to imagine that somewhere near the Arctic Circle cities and villages with multi-thousand population are growing vigorously and that large industrial objects and gas arteries are being erected and are operating. But all this is true. The Medvezh'ye field, which was brought up to its design capacity--65 billion cubic meters--last year, has been producing gas for six years now. Urengoy, which will be ready to produce 100 billion cubic meters of gas in 1982, is catching its elder brother in enormous steps as if wearing seven-league boots. On the whole, more than 80 percent of the increase of this most valuable raw material in the sector is being produced during the current five-year plan by the young industrial region of Western Siberia.

The task posed by the party and government--to develop a large territorial and industrial complex in Western Siberia--demanded high concentration of capacities and unprecedented scope of work from the builders. Many concerns lay on the shoulders of those who will construct housing and objects of social and cultural-service designation for the first arrivals.

When the aircraft comes in for a landing over Nadym, blocks of modern buildings, squares and wide streets pass below and few of those who arrive would think that only 10 years ago there were swamps and impassable abysses on the site of the city.

To erect a modern city in the Arctic is the task which the town builders have posed to themselves and primarily the Leningrad Zonal Scientific Research Institute of Standard and Experimental Design. But there are frequent guests from the Arctic to consider the two most unfavorable factors--the severe winter cold which drives the mercury column down to -50°C and snowstorms.

The specialists proposed mutual arrangement of buildings in which the wind does not enter the space between them and an internal microclimate is created there. The main streets go directly from north to south--mainly because this is how the prevailing winds blow here. The microrayons are divided into housing complexes, each of which consists of three multi-apartment buildings compiled in the form of the letter "C." In this case the facade of each building is reliably protected against direct air flows by the block standing in front of it. The layout inside the complex is such that its residents do not have to go outside in case of bad weather for provisions and objects of primary necessity--the appropriate stores are located inside the complex.

The internal layout of the buildings themselves, construction of which the Nadymzhilgazstroy Trust organized in the Arctic version, is also unusual. Forced-air ventilation with supply of warm air and rooms for drying clothing are provided in the apartments. Each new arrival is unalterably struck by the rates at which this Arctic town is advancing on the tundra. A 600-seat movie theatre, Palace of Culture, cafes and restaurants and the large Svetlana manufactured goods shop are already operating. Plans for a sports complex, railroad station, department store and service enterprises are being worked out.

Nadym is typical for Western Siberia by the high rates of development. It is also typical by the fact that the rates nevertheless lag behind the even more vigorous population growth--the consequences of a massive influx to the enormous spaces and extensive mining of underground storehouses.

"During the last few months new large industrial objects have become operational," says the deputy director for capital construction of the Production Association Nadymgazprom Kh. Kloss, "and the complex gas preparation installation No. 9 at Medvedzh'ye, a production equipment repair enterprise and separator pumping stations have become operational and municipal treatment plants are under construction. There is an additional need for more than 1,000 persons to service them, but there is no place for them to live. And this is in addition to the fact that the builders have taken on construction of approximately 23,000 square meters of housing area for next year."

Several years ago they frequently attempted to solve the acute housing problem in Western Siberia by a simple increase of construction equipment, which in itself is difficult, taking into account the marked seasonal nature of the work. Therefore, those essentially new methods of development which were recently put into construction practice are remarkable.

We are talking primarily about wood construction, an example of which is Urengoy. They showed me placards at Urengoygazpromstroy Trust with layouts of the future city--modern nine-story apartment buildings, restaurants and a television tower. All this will be constructed, but a wave of new arrivals is now breaking over Urengoy. And this was why the decision was made more intelligently--to build the first microrayons of wood. Without waiting for the major foundations to be laid, the builders one after the other began to erect two-story frame buildings heated with gas and having electricity and sewers. These buildings are being erected according to the general plan. And while the gas workers are living in the new housing, a trade center, school and other objects are being built of concrete alongside. Time will pass and nine-story blocks of apartment buildings will stand alongside the first "landing" microrayons.

The main difficulty of construction in the local regions is that it frequently began to thaw under the foundations of buildings constructed on permafrost soils and they began to float due to the ice loads. This led to settling and warping of the structures. It was decided to erect the objects on metal pilings. All buildings, including the housing and social-cultural service objects, are being constructed by two production principles: pilings are driven into the frozen zone or into a zone preheated by steam. The first principle is being used extensively at Medvezh'ye where the temperatures of perennially frozen soils reach -2 to -3°C. This principle of construction is unfeasible at Urengoy, where the permafrost is "warmer"--approximately 0°C--and therefore a zone six meters in diameter and 11 meters deep is first heated with steam according to the calculations of specialists from the Mosfundamentproyekt Institute [expansion unknown].

The watch-expeditionary method of developing the fields occupies an important place among the effective methods of accelerated development of the fields. A watch village is its own type of leading outpost of gas and oil workers and has now become a widely distributed housing complex in the Tyumen' area--a village with hotel-type buildings where the personnel servicing the UKPG [expansion unknown] live. The watch is changed on an average of once per week, being brought by helicopter to the city for rest. This idea was intensively discussed by the oil and gas workers, managers and economists. According to calculations of the institutes of Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises], centralized introduction of watch villages in Tyumenskiy Kray promises to yield a saving numbered in hundreds of millions of rubles during the next 15 years, provided--this is especially important--there is a stable relationship with the city and there is an adequate amount of housing in it.

Watch villages have made it possible not only to accelerate development of fields, but largely brings resolution of the housing problem closer for the Siberians. For example, there are now approximately 130 of these villages in the Khanty-Mansiysk Autonomous Okrug alone. More than 25,000 persons will live in them.

Now, according to specialists, "watches" are undergoing a kind of second birth. We are talking about introduction of block-complete methods of construction of buildings and entire housing complexes into the practice of village construction from standardized finished blocks which can be interchanged if necessary and new ones added on. For example, this is the type of two-story building for 50 seats developed by specialists of Sibkomplektmontazh Trust. The building consists of blocks--two rooms and part of a corridor. Individual blocks--the dining room, cultural-service rooms and sleeping rooms--are connected to each other by covered passages. The supporting aluminum structural members are insulated with foam plastic. This building can be easily delivered in individual sections to the most remote tundra by air transport.

A watch complex of a different type--a single-story complex also built from standardized block containers--was developed at the October Assembled Steel Section Plant of Minneftegazstroy. The repair brigades that service the major pipelines and watches of operators will live in a vast building supplied with ventilation and sewage systems. Forty persons can be housed in this building.

The high level of planning decisions and their successful introduction have now received the approval comments of many leading drillers.

An important reserve for Western Siberian architecture is clear organization of the work of construction agencies and subdivisions. According to calculations of specialists of the Council to Study the Productive Forces attached to Gosplan of the USSR, a complex approach to development of new regions will save 18 percent of capital investments in housing and public-service construction. Convincing confirmation of this theory can be the leading organization of matters in the Central Ob' region.

Even at the beginning of the 1970's, it became clear to the oil workers that their main contractor--Minneftegazstroy--simply did not have the capacities to construct even larger blocks of apartment buildings and public and cultural-service objects on a broad front in addition to major pipelines, compressor stations and industrial bases. The strategy of aiming toward problems of developing this territorial-industrial complex of several ministries simultaneously, developed by the oil workers jointly with the Tyumen' Obkom of the Trade Union of Workers of the Oil and Gas Industry, became their merit.

Besides Minneftegazstroy, subdivisions of Minpromstroy [Ministry of the Construction Industry], Mintransstroy [Ministry of Transportation Construction], Minenergo [Ministry of Power and Electrification of the USSR], Minmontazhspetsstroy [Ministry of Installation and Special Construction Work] and other agencies was included in development. It is remarkable that the construction bases of each organization existing in specific regions were taken into account when "laying out" the work. For example, considering that a large housing construction combine was built at Surgut,

development of the regions of Surgut, Nefteyugansk and Uray imposed the duty upon this agency. And the Ministry of Industrial Construction alone is engaged in complex construction of Nizhnevartovsk, including the housing and social-cultural service objects. It has been proposed to turn the local DSK [House-building combine] over for operation this year.

This individual responsibility of contractors for putting large objects and entire blocks into operation permitted a sharp increase of the capacity for construction of housing for the mineral prospectors. Initially attached with difficulty and fragmentation to the management mechanism of the complex, the agencies have now largely acquired a taste for construction of "their own" objects. It is interesting that during the last five-year plan, for example, Minpromstroy even overtook the traditional contractor--Minneftegazstroy (319,000 square meters)--in the volume of introducing housing area (375,000 square meters). The construction detachments of other agencies are also doing their bit, although in smaller volumes.

Of course, the Central Ob' region also has its own complex problems but the strategy of complex development of the region, more flexible in organization, largely contributes to resolution of them. To do this, the oil workers are undertaking newer specific steps. For example, Minnefteprom also intends to recruit Minstroy of the USSR to construction in the Tyumen' region. The territorial association of this ministry, located at Tomsk, will double the volumes of all work by the end of the current five-year plan. And in the final analysis this is not only creation of normal housing-service conditions for the oil workers, but also an increase of "black gold" production. The production rates gained by the producers depend directly on the conditions under which they live and work.

To provide the first drillers of Western Siberia with services worthy of the high rates of development of the fields--this is the slogan under which the collectives of the construction organizations are now working.

6521
CSO: 1822

NEW, VERSATILE SOCKET WRENCH DESCRIBED

Moscow NEFTYANIK in Russian No 10, Oct 79 p 40

[Article: "Socket Wrench"]

[Text] The wrench is designed for safe loosening (tightening) and unscrewing (screwing) of nuts on the crank pins of pumping jacks during their maintenance and repair.

The socket wrench can be used for pumping jacks of various types. It permits loosening (tightening) of nuts without stopping the jack and has a ratchet device which prevents rotation of the nut in theopposite direction. The wrench is equipped with a locking device which attaches it to the crank and has a bolt and a locking lever on the handle of the wrench.

The socket wrench consists of the ratchet housing, arresting device, handles, two locking bolts with nuts and two catches on the lever.

The wrench is recommended for serial production. The design is protected by inventor's certificate No. 427856.

The developer was VNIITB [All-Union Scientific Research Institute of Safety Engineering in the Petroleum Industry] (370008, Baku-8, ul. Chapayeva, 68).

The manufacturer is the Plant imeni Kirov of the Production Association Azneftemashremont.

Specifications

Dimensions of nuts to be turned (under the wrench), mm	
minimum	75
maximum	95
Maximum permissible torque, Nm	7,000
Nominal torque with application of force of 200 N, Nm	
on handle	80
on lever	280
Overall dimensions, mm	570 X 350 X 80
Mass of wrench with insert bushing and lever, kg	18.5

PERFORMANCE INDICATORS FOR OIL PRODUCERS EXPLAINED

Moscow NEFTYANIK in Russian No 9, Sep 79 and No 10, Oct 79

[Article by S. Levin, deputy chief of the Economic Planning Administration of the Ministry of the Petroleum Industry: "Planning-Estimate and Fund-Generating Indicators of the Production Association and Its Main Subdivisions"]

[No 9, Sep 79 pp 18, 19, 23]

[Text] An aid to those studying economics.

Successful solution of the important tasks that face the petroleum industry in providing the national economy with fuel, combustible and lubricating materials, and raw materials for the petroleum-refining and petrochemical industries requires the effective functioning of the entire economic mechanism of the industry's management, an extension and intensification of the economic motivation of production associations, their subdivisions and each worker to achieve higher final results, and an overall rise in the level of work in economics at enterprises. The system of economic education that is being promoted in all production associations, an activity that embraces a large number of blue-collar and white-collar workers, engineers and technicians, plays a major role here.

As an aid to those who are studying economics, the journal NEFTYANIK is beginning the publication of a series of articles on the most important questions of petroleum-industry economics under the overall editorship of S. M. Levine, deputy chief of the Economic-Planning Administration of Minneftekhprom.

The effectiveness of functioning of the industry's economic mechanism and the efficiency of economic methods of management are determined to a great extent by a system of plan evaluation indicators. A set of such indicators determines the quantitative and qualitative criteria of the economic

plan, it enables the state plan for the industry to be linked with the plans and economic interests of the production associations, the direction and concreteness of plan goals are realized within it, and it is used as the structure of the system for the economic stimulation of enterprises and material and moral incentives for workers and for summing up socialist competition results.

Improvement of the system of plan indicators is a most important measure for improving planning quality.

The plan indicator system for the petroleum-producing association was formulated with comparatively few indicators, which are approved by higher organs. During the Tenth Five-Year Plan this system was supplemented by indicators that regulate the reaching of such important qualitative goals as the rate of growth of labor productivity and the level of operating costs for the product, and, for drilling, the duration of the well-construction cycle. These indicators have been introduced in order to intensify planning supervision over the petroleum-producing associations. The set of them adequately and fully characterizes the association's production-economics activity.

However, the plan evaluation indicators that are in effect within the industry are not always completely consistent with each other. Some of them, for example, such as the amount of gross income and total profit for industrial-operations transport administrations, set the specific interests of auxiliary and servicing enterprises against the final results of the oil-producing associations in the matter of supporting the recovery and shipment of crude oil, gas condensate and gas. In order to eliminate such contradictions, the plan evaluation indicator system should be improved in such a way as to provide economic motivation for the production association and its subunits to achieve the best final results for the industry through the establishment of a direct dependence between the fulfillment of the plan indicators and work incentives, in order that the various indicators will consider not only the particular aims of the subdivision but also the final task of the association and the industry. Each enterprise, in fulfilling or overfulfilling plan goals for the indicators established for it, should thereby help to improve the industry's final indicators.

An important component of the system for plan evaluation indicators are the indicators for forming incentive funds. The system of economic incentives in rates per ton that were introduced into the petroleum industry in 1977 enables the economic interests of the oil-producing associations to be coordinated more closely with the industry's final task, creating a unity of purpose for all the diverse enterprises and organizations of the petroleum-producing association, the economic interests of which are aimed at solving the final tasks of the association and the enterprise. The time has come to supplement its system for forming incentive funds within production-association subdivisions. Such a system should establish the economic dependence of the size of the incentive funds for each subdivision on its contribution to the final results of the activity of the economic complex as a whole.

The system of plan evaluation indicators that was developed by the economic services of the industry and by VNIIOENG [All-Union Scientific-Research Institute for Organization of the Management and Economics of the Oil and Gas Industries], which enables a quantitative and qualitative evaluation of the production and economic-affairs work of the association and its subdivisions to be produced, meets these requirements. It determines the place of each indicator, taking into account the degree of its effect on the industry's final results. In 1979 the system of plan evaluation indicators began to be applied in Tatneft' [Association of the Tatar ASSR Oil Industry], Bashneft' [Association of the Bashkir ASSR Oil Industry] and Nizhnevolzhskneft' [Association of the Lower Volga Oil Industry].

All the indicators in the system were divided into three groups, taking into account their influence on the production process:

/--indicators for the production and delivery of output;

--indicators for creating the necessary production capacity and fixed capital as the most important prerequisites to providing for expanded reproduction within the industry; and

--qualitative indicators of the work of all elements of the production association./

The /first group/ of indices that are being used for evaluating production operations and for summing up the results of socialist competition, both for the production association and for the NGDU [oil and gas production administration], includes:

--the recovery of oil, gas condensate and gas;

--the turnover of oil and gas condensate;

--the delivery of gas;

--the delivery of oil of wide stabilization cut;

--realized output; and

--the products mix of the most important types of output, nonfulfillment of the plan for the production of which does not produce a bonus award./

The industry's final indicator--/the amount of crude oil, gas condensate and gas recovered/--is adopted as the main indicator in the evaluation of production activity and in economic motivation. It is this that is the basic indicator both for the association as a whole and for the NGDU and such production elements that support recovery as the administrations for increasing withdrawal from reservoirs and for overhauling wells, industrial-operations transport administrations, and administrations for production equipment servicing and for supplying complete sets of equipment. With a view to creating overall material motivation for the whole collective of the production association to produce each ton of oil, /only this indicator

is used to form economic incentive funds/, and the remaining indicators are used in one degree or another for awarding bonuses to collectives

The successful fulfillment by production associations of tasks for the recovery of crude oil depends greatly upon the activity of servicing enterprises. This requires that the main production operation be provided on time, uninterruptedly and completely with all the types of operations and services that are necessary; this is determined on the basis of the requirements of this type of production work. Overfulfillment of the planned amounts of operations and services is, as a rule, undesirable; it often affects negatively the final indices of the production association, leading to growth in expenditures per unit of output. An increase in the amount of services by auxiliary and servicing subdivisions can be justified only by overfulfillment of operating plans by the main production activity. Consequently, the incentive for auxiliary production work should be established in accordance with the standards as a function of the /amount of crude oil recovery/ by the NGDU being served or the /number of wells turned over to the client/ for the UBR [drilling administration] being served. Aside from this, plan evaluation and fund-forming indices are established for each auxiliary production element; these indicators characterize the element's quantitative goals in support of crude oil recovery.

Thus, for industrial-operations transport administrations, such plan evaluation indicators as the /amount of services in vehicle-hours by type of service for the types of industrial-operations transport and types of special equipment/ is established. In accordance therewith, the credit for incentive funds for the UTT's [industrial-operations transport administrations] is made by use of the following indicators: /the rates per ton for the recovery of crude oil, gas condensate and gas/ for the NGDU being serviced and the /rates per well turned over to the client/ for the UBR being served, and also /rates per unit of technological services and haulage volume/. These plan evaluation and fund-forming indices for the UTT were used successfully in Kuybyshevneft' [Association of the Kuybyshevskaya Oblast Oil Industry]. Their use enabled the servicing of the main production to be improved and the growth in expenditures for payment for transportation and special-equipment services to be contained, since in so doing no increase in gross income was necessary from the UTT; but the fulfillment of the planned work volume for each line item of the products list was required.

For administrations for operating-equipment servicing and for equipment outfitting, in addition to indices for the volume of oil recovered and wells turned over, indicators for /realization of funds for the basic products mix and for the amount of services and operations of a production nature/ are established as the basic indicators.

Plan evaluation indicators of the /second group/, which characterize newly created production capacity, play a major role in achieving the industry's final result--an increase in the recovery of oil and gas. This group includes indicators that evaluate production activity both of the associations as a whole and of their subdivisions, including NGDU's and UBR's:

/--the introduction of oil-producing capacity;

--the introduction into operation of new oil and gas wells;

--the introduction of installations for treating crude;

--the introduction of oil pipelines;

--the integrated automation of the fields;

--the introduction into operation of fixed capital;

--the introduction of apartment houses (total space);

--the recovery of crude oil from new wells;

--growth of reserves by categories B + C_1 of [illegible], gas condensate and gas;

--the number of wells turned over to the client;

--newly created oil-producing capacity;

--the volume of new methods introduced for increasing withdrawal from reservoirs; and

--the amount of crude recovered by increasing with withdrawal from reservoirs./

The plan evaluation indicator of /introduction into operation of fixed capital/ characterizes an overall increase in the capacity of the production association or its subdivisions. At the same time, the inclusion in the system of plan evaluation indicators of a goal for the /introduction of installations for the treatment of crude, the introduction of pipelines, and the integrated automation of the fields/ strengthens monitoring over the introduction of these facilities into operation, which is of great importance in supporting stable operation of the industry. The indicator of /recovery of crude oil from new wells/ is included as supplementation to the indicator of the total amount of planned oil recovery. Nonfulfillment of this indicator entails a reduction in the amount of the bonus, and this means it will help to raise responsibility for bringing new oil reserves into development and for introducing oil-recovery capacity.

In order to increase the responsibility of associations and NGDU's for assimilating new methods for increasing oil withdrawal, the system of plan evaluation indicators includes tasks on /the amount of introduction of new methods/, and also on the /volume of recovery through new methods/. The plan evaluation indicators of production associations and NGDU's include also a task for /growth of reserves of oil, gas condensate and gas under categories B + C_1./ This same indicator, which characterizes the final result of the exploratory drilling activity, is being extended also to UBR's. Both the client and the contractors will thereby be materially motivated to fulfill the plan for growth in oil reserves. Because of the high degree of

dependence of growth in reserves on natural geological conditions, this indicator is used as an additional prerequisite to quarterly bonus awards, and it will be used basically for the creation of 10 percent of the total of the material incentive fund that is earmarked for payment for the year's operating results.

For administrations that increase oil withdrawal from reservoirs and that overhaul wells, the indicator of the /number of wells on which overhaul has been completed/ is supplemented by the indicator of the /recovery of crude oil from wells on which overhaul has been completed/. This will intensify motivation of the UPNP's [administrations for increasing oil withdrawal from reservoirs] and KRS's [administrations for overhauling wells] to raise the quality of the work.

The inclusion in the plan evaluation system of the indicator /newly created oil-producing capacity/, which is called upon to play the main role in evaluating the activity and to motivate drilling organizations, has become especially important. The fact is that in 1977, in connection with introduction of the system of tonnage-rate credits to the incentive fund for the production association as a whole, the subbranch system for forming funds according to the level of computed profitability in the drilling organizations has ceased. This system basically fulfilled its task. Now the production associations have obtained the right to solve independently questions of the distribution of the incentive funds that they have established for subordinate subdivisions, including those for drilling organizations. In so doing, various associations use different methods and indicators to create incentive funds for drilling organizations. Incentive funds, as before, were set in accordance with the indicator for computed profitability in 11 oil regions, for profit in 5 regions, for the amount of penetration in 1 region, by direct distribution as an established percent of the wage fund in 2 regions, and for the number of well-days for wells at the client's disposal in 1 region.

The diversity of indicators for incentives made it possible to single out the indicators that were more effective in helping to create economic motivation for drilling organizations to reduce the length of the well-construction cycle and to turn new oil-production capacity over to clients rhythmically. It must be said right off that the method for crediting the material-incentive fund in percents of the wage fund of drilling organizations cannot serve the aims of raising production effectiveness, since the method does not act on it economically. And the indicators neither of computed profitability nor of profit can in due measure focus drilling organizations on improvement of the final results of the activity of the oil-production association. These indicators only indirectly affect improvement of the final result of the activity of the association as a whole.

Since incentive funds for the whole collective of the production association, including drilling organizations, began to be formed under rates per ton as a function of the amount of oil produced, a direct incentive for drilling organizations to introduce new oil-recovery capacity in as short a time as possible in order to increase the association's oil production to the maximum had to be created. This purpose is achieved directly by an

increase in the amounts of drilling work, a reduction in the time used to construct wells, and an acceleration of the turnover of the wells to the oil and gas producing administrations. Because of this, incentive funds for motivating drilling-organization collectives should be formed not in accordance with particular indicators of drilling work effectiveness; the budget-estimated cost of the work done, the amount of penetration, the number of wells completed by construction--none of these can serve as a system for fund-forming indicators. The main fund-forming indicator for drilling organizations should be the amount of newly created oil-producing capacity, which characterizes their contribution to the final results of the associations' activity.

In 1977-1978 a new method for forming drilling-organization incentive funds was introduced experimentally in Tatneft'. Its development and introduction were based on the need to reevaluate the existing economic levers for drilling and to provide for a direct tie between the sizes of drilling-organization incentive funds and their contribution to the final results of production association activity. The /amount of newly introduced oil-production capacity/ was adopted as the basic indicator for crediting the incentive funds. This is determined by the number of well-days at the client's disposal for the wells completed by construction, from the time of their turnover to the end of the plan (or reporting) period. This indicator characterizes the potentially possible duration of operation of the new oil-producing capacity that the drilling organization has created. It reflects in generalized form the results of plan fulfillment with regard to the two most important indicators of drilling-organization activity: the number of wells turned over, and reduction of the length of the cycle for building them. The shorter the well-construction cycle time and the more wells that are turned over to the client, the greater will be the cumulative time that the new wells are at the client's disposal, and the greater will be the amount of oil and gas that the oil and gas producing associations will obtain from them.

Credits to the material-incentive fund have been made in accordance with the standards established in rubles per well-day at the disposal of the client. For an above-norm number of well-days, an increased standard was established in order to encourage well turnover ahead of time. The operating results of Tatneft' drilling enterprises in 1977-1978 indicated an active motivational role for the new system of forming funds and also the advantage of the plan evaluation indicators that were made the basis for the system. Where there was overall fulfillment or overfulfillment of plans for penetration and turnover of wells for operation, the associations' drilling enterprises greatly improved the qualitative indicators for the work. The duration of the construction cycle for development wells was reduced in 2 years from 53 to 38 days, and average operational time for wells completed by construction in the months of turnover thereof to the end increased from 3.9 to 10.9 days, and from 168 to 181 days for the year. Uncompleted construction was greatly reduced, and the rhythmicity of drilling-enterprise operations was improved. Additionally, 260,000 rubles were credited to the planned material-incentive funds in 1977 and 300,000 rubles in 1978, including the 70 percent of this sum that went for an increase in the operating time of wells completed by construction.

The indicator for newly created capacity can also be expressed by the computed recovery from new wells during the time they are at the disposal of the client. For this purpose, the time the wells are at the disposal of the client should be multiplied by the average actual flow of the new wells. Such an indicator should stimulate drilling enterprises to raise the quality of drilling into the productive reservoir and thereby increase the flow of new wells./ However, the use of such a variant of the indicator for newly created capacity requires experimental verification.

11409

[No 10, Oct 79 pp 26-29]

[Text] The third group includes planning and estimate indicators which estimate the qualitative results of enterprise operation:

--balance-sheet profits;

--the cost of the product and operations;

--production expenses;

--labor productivity;

--specific labor expenditures per well;

--the wage fund;

--the limit of the number of workers and employees;

--indicators of the technical level of production, which include the casing-head gas utilization factor, the utilization factor of the operating stock of wells, the time expenditures for the cycle of operations from the beginning of well construction to the time they are turned over for operation, the commercial rate of drilling and the utilization factor of the production transport fleet.

The most important of these indicators are the balance-sheet profits, the cost of products and operations and labor productivity. Their effect is distributed both to the associations as a whole and to the NGDU [Oil and gas administration] and UBR [Admin'stration for Drilling Operations].

All calculations with the budget are made and incentives funds are formed and expanded production is accomplished to a significant degree from profits. The cost of the product and operations is an important indicator of the increase of production efficiency which permits one to estimate the extent to which basic funds and material, labor and financial resources are being efficiently utilized. Conditions of the overall material interests of the collective in efficient management of facilities, reducing cost and increasing the mass of profits are created by the economic mechanism used in the petroleum industry. This is achieved by introduction of

graduated rates of deductions to the incentives funds and by using the combined calculated profits to create the incentives funds. In this case the graduated rate for above-plan oil production for the total incentives funds is used to an increased extent, while the source of creating additional incentives funds on this scope is profits above the plan. Its required scope is 2.5 times greater than the value of planned profits per ton of oil. This system stimulates receipt of above-plan profits, forcing the enterprises to search out all possibilities for reducing production expenses. The results of activity during the past two years of the Oil-Producing Associations Glavtyumenneftegaz [Main Tyumen' Administration for the Construction of Petroleum and Gas Industry Enterprises] and Tatneft' [Association of the Petroleum Industry of the Tatar ASSR] are indicative. Above-plan profits in these associations were created as a result of the activity of both industrial and drilling and auxiliary enterprises due to overfulfillment of the plan in the volume of production and by reducing production expenses (table).

	Glavtyumen-neftegaz	Tatneft' Association
Above-Plan Profits, Percent, Including Those as a Result of the Following Activity:	100	100
of industrial enterprises	68	72
of drilling enterprises	19	11
of auxiliary enterprises	13	17
Sources of Additional Profits, Percent, Including Those Due to:	100	100
overfulfillment of the plan in production volume	80	72
of relative saving of production expenses	20	28

The combined calculated profits from the balance sheets of industry and contract drilling are an important element of the incentives system. It is used to form the incentives funds of the association. And since these funds are created by the association by graduated rates and are intended

for its industrial and drilling enterprises and organizations, the source of creating them should be the combined profits of all these enterprises and organizations. In the absence of or insufficient combined calculated profits, the incentives funds of the association are calculated only within available sources. This means that if there is a loss of some enterprises and organizations, including drilling organizations, the entire collective of the oil-producing association may find itself without incentives funds. In order not to undermine the incentives of normally operating enterprises, the association should ensure profitable work of absolutely all its subdivisions. The use of combined calculated profits from the balance sheets of industry and contract drilling as a source of generation of economic incentives funds created conditions for the total material incentives of the collectives of all enterprises and organizations of the oil-producing association in efficient management of facilities.

Thus, the graduated rate system not only stimulates overfulfillment of the plan on the full-scale volume of oil, gas condensate and gas production, but also directly contributes to an increase of the economic indicators of the oil-producing and drilling organizations and inspries them toward improving the final indicators of the association's activity.

The use of a graduated rate system and of combined profits as a source of incentives fund generation to improve the operation of drilling enterprises played an especially significant role. The drilling enterprises of the sector underfulfilled the profits plan during the first year of using the new incentives system. In this case the unsatisfactory work of the drilling enterprises of some associations deprived their collectives of part of the incentives funds due to a lack of a source for generating them.

In 1978 the level of organization of drilling operations in the association increased, which was reflected in the economy of the subsector. The shortfall of profits permitted a year earlier was almost doubly covered by overfulfillment of the plan, the profits in drilling increased by 0.8 and the use of calendar time was also improved: the specific weight of productive time increased by 1.5 points in exploitation drilling and by 6.1 points in test drilling.

The main indicator which determines the degree of laboriousness in oil production is the specific labor expenditures per well. A decrease of them is the main factor which ensures an increase of labor productivity. Therefore, implementation of measures to reduce specific labor expenditures of industrial production personnel and of all workers is the constant task of the sector and the specific labor expenditures per well are included in the planning-estimate and fund-generating indicators for production associations and NGDU.

Direct material incentives of enterprises in reduction of labor expenditures is provided by the sector system of economic incentives. In 1978, 5.9 percent of the incentives fund was created by this, including 17

percent of its additional value (specific labor expenditures throughout the sector as a whole were reduced from 1.86 to 1.77 or by 4.8 percent with a planned 3.2 percent). Labor expenditures in the production associations of Glavtyumenneftegaz were reduced by the highest rates (by 16.7 percent), which is especially important with regard to the high level of wages and the specific difficulties with staffing the northern fields with a work force. But the reserves have been far from exhausted. It is sufficient to say that the specific labor expenditures in 11 oil regions alone are below the mean sector level, while there is still much to be done in the remaining regions to achieve the mean sector level of 1978 (the specific labor expenditures per well are even higher in nine regions--more than 2.5 persons).

Important significance is given to indicators of the technical production level which are different for different enterprises of the association. Thus, an increase in the degree of utilization of the operating stock of wells, which has a great effect on the production and economic indicators of the association as a whole and of the NGDU, should be estimated in the system of planning and estimate indicators by means of the generalizing indicator of the utilization factor of the operating stock of wells. This factor is determined as the ratio of the operating time of the wells to the entire schedule time of the operating stock. The final result of improving the use of operating, non-operating and developed wells is reflected in this indicator.

It is suggested that the indicator of the time expenditure for the cycle of operations from the beginning of well construction to the time they are turned over for operation be used to stimulate work to reduce the deadlines of well construction, the need for which is especially emphasized in the decisions of the 25th CPSU Congress.

The role of the utilization factor of production transport is being increased to stimulate the production transport administrations toward more complete use of available transport facilities. This indicator is used as an additional condition for awarding of prizes.

In the final analysis the entire system of planning-estimate indicators used for fund-generation purposes, awarding of prizes and determining the results of participation in the socialist competition creates the necessary economic conditions for optimum solution of the final problems of the sector.

In 1977, some elements of the new system of planning-estimate indicators underwent experimental testing and the new system of material incentives fund generation was used throughout the sector as a whole as the most important element of the economic mechanism of administration directed toward solution of final sector problems. The basis of the incentives fund generation system in the sector in 1977-1978 was the volume of oil, gas condensate and gas production. Selection of this indicator for purposes

of economic stimulation made it possible to link the economic interests of the oil-producing enterprises to the final purpose of the state plan for development of the sector--to supporting the needs of the national economy for raw material for motor fuel and oil production and production of petrochemical products and to create a unified and indirect criterion of the goal for the entire sector collective.

The fact that the full-scale indicator of the oil, gas condensate and gas production volumes was also used has a decisive effect on improving the economic results of the activity of the sector and of the oil-producing associations. It is the simplest and most understandable for any worker of the sector than the previously utilized indicators of sales, profitability and calculated profits. Thus, its use is more effective.

The norms of the material incentives fund generation were used in 1978 both throughout the sector as a whole and throughout the oil and gas-producing associations in the form of graduated rates of deductions for:

--maintaining the level of oil, gas condensate and gas production,

--a planned increase of oil, gas condensate and gas production,

--above-plan oil, gas condensate and gas production due to the additional task, counterplans and socialist pledges,

--the percentage of increase in labor productivity (for the sector alone),

--the percentage of reducing labor expenditures (for the associations alone).

The first three of these norms are based on the main indicator for development of the sector--oil, gas condensate and gas production. In this case the value of the graduated rate for the planned production increase is usually established as 1.5-2 times higher than for maintenance of production at the level of the previous year's plan, but below the level of the graduated rate established by directive bodies for above-plan production. The two latter are based on the planned indicator of the growth rates of labor productivity throughout the sector and the planned task to reduce specific labor expenditures throughout the oil-producing associations, determined on the basis of the calculated planned indicators of the current year and the calculated indicators of the previous year according to the number of workers of industrial and production personnel and the mean annual stock of operating oil and gas wells.

A very important and effective measure to stimulate an increase of oil production was introduction of an increased graduated rate of deductions to the material incentives fund for each ton of oil produced due to the additional task established by the association. Incentives according to the increased graduated rate yielded positive results. The use of the operating

stock of wells was improved and introduction of oil-producing capacities into operation was accelerated in the oil regions which fulfill the plan. Additional material incentives funds provided by combined above-plan profits were created in these associations due to measures to reduce production expenses.

According to the level of fulfilling the established plans and tasks, the oil-producing associations which fulfilled and overfulfilled the production plan in 1978 added 10.3 percent of the material incentives funds by graduated rates to the plan. The material incentives fund was 6.0 percent below the planned level for the associations that did not fulfill the production plan. The graduated rate system for oil production throughout the oil-producing association of the sector as a whole made it possible to add 8.6 percent of the material incentives fund above the plan, including 83 percent of the total overfulfillment due to additional oil production mainly at a graduated rate of 2.5 rubles per ton and 17 percent of the total overfulfillment for reduction of specific labor expenditures. Compared to the previous year, the situation with material incentives fund generation in 1978 was improved significantly, its scope increased, undercalculations due to failure to fulfill the plan and a lack of profits in the associations were reduced by a factor of 2.4, wages per worker comprised 107 percent of the planned calculation and increased by 6.9 percent compared to 1977.

The effective period of the increased graduated rate of deductions to the material incentives fund was also applied to 1979.

The results of operation of the oil and gas-producing associations in 1977-1978 indicated an effective stimulating role of the incentives fund generation system introduced in the petroleum industry. The use of it, having provided the creation of the total material incentives of the oil-worker collective in achieving the final goal--an increase of oil, gas condensate and gas production--strengthened the economic methods of management in the sector and contributed to an increase of production efficiency.

Improvement of the entire aggregate of economic levers of affecting production in the oil-producing association, practical testing of the system of planning-estimate and fund-generating indicators and bringing them into conformity with the sector system will contribute to further success in the work of the sector. Intensification of the complex effect of planning-estimate indicators, economic levers and incentives on the increase of production efficiency and achievement of the final sector results is the most important task of the economic services of the petroleum industry.

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BRIEFS

BAM ZONE TIMBER--With the opening of working traffic on the 500-kilometer eastern section of the Baykal-Amur Maun railroad, timber procurement workers have gained access to new forest resources. Already timber from the BAM zone accounts for one-sixth of the timber procured in the far east. [Khabarovsk Domestic Service in Russian 0930 GMT 19 Nov 79 OW]

VANINO CHIP PLANT--A pneumatic transporter which conveys the finished product directly to the wharves of Vanino port has been commissioned at the Vanino industrial wood chips plant. Previously chips were carried to the port by vehicles. The new system will eliminate losses of finished product, save fuel, and release several vehicles for other needs. [Khabarovsk Domestic Service in Russian 0900 GMT 2 Oct 79 OW]

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BRIEFS

FAR EAST WATER SUPPLY--Glavdalvolstroy's mechanized ameliorator detachments have put into operation more than 150 water supply systems in sovkhozes and kolkhozes in the far eastern region this year alone. During the years of the Tenth 5-Year Plan period they have drilled nearly 800 deep artesian wells in arid and remote areas of the far east. New Soviet made automatic drilling installations mounted on tractors and motor vehicles have helped in the construction of water supply systems in hundreds of villages. The electrical deep-well submersible pumps made in the Soviet Union, Poland and the GDR have also helped in this work. [Vladivostok Domestic Service in Russian 0930 GMT 15 Nov 79 OW]

KAMEN-RYBOLOV WATER SUPPLY--Pure artesian water has been made available to residents of Kamen-Rybolov in Khankayskiy Rayon after commissioning of a water supply system, which is one of the largest in Primorskiy Kray. The system consists of a series of deep wells, a water conduit, an electrified pumping station and a large sectional storage reservoir. [Vladivostok Domestic Service in Russian 0930 GMT 15 Nov 79 OW]

IRRIGATION RESERVOIR--The largest reservoir for irrigation of agricultural land has been commissioned in the south of Primorskiy Kray, in the basin of the Razdolnaya River. A 1-kilometer dam was built across the tributary Slavyanka River resulting in a reservoir of nearly 6 million cubic meters of water with a surface area of more than 200 hectares. [Vladivostok Domestic Service in Russian 0930 GMT 14 Nov 79 OW]

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